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Committee on Energy and Natural Resources for Development

**Report on the second session
(14-25 August 2000)**

Economic and Social Council

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Note

Symbols of United Nations documents are composed of capital letters combined with figures.

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Chapter I

Matters calling for action by the Economic and Social Council or brought to its attention

A. Draft resolution for adoption by the Council

1. The Committee on Energy and Natural Resources for Development recommends to the Economic and Social Council the adoption of the following draft resolution:

Case studies from Governments and international institutions on matters relating to integration of water and land management in the context of Agenda 21 for sustainable development

The Economic and Social Council,

Taking note of the report of the Committee on its second session,

Recognizing the importance of highlighting the good examples of implementation of the recommendations of Agenda 21,[1]

Aware that progress has been achieved at various national and subnational levels towards implementation of the activities of Agenda 21, and aware also that some success has been achieved on various issues of integration of land and water management for sustainable development,

Recognizing that challenges have to be overcome in securing food supply, providing safe drinking water supply, protecting the ecosystem, meeting the basic needs of health and sanitation, managing water-related disasters, sharing water resources and ensuring effective stakeholder participation in water management,

Invites Governments and international organizations to make available, as background material in the preparatory process of the ten-year review of the implementation of the outcome of the United Nations Conference on Environment and Development, case studies carried out by them and recommends that the topics on which case studies may be conducted should include, inter alia, river basin cooperation; the protection of catchment areas for the management of drinking water sources; community involvement in land and water resources management for agriculture; water supply in both rain-fed and irrigated areas; integrated land and water resources management; and impacts of management of water resources, both quality and quantity, on the economy of a country or region.

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[1] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992*, vol. I, *Resolutions Adopted by the Conference* (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex II.

B. Draft decision for adoption by the Council

2. The Committee on Energy and Natural Resources for Development recommends to the Economic and Social Council the adoption of the following draft decision:

Report of the Committee on Energy and Natural Resources for Development on its second session and provisional agenda for the third session of the Committee

The Economic and Social Council:

(a) Takes note of the report of the Committee on Energy and Natural Resources for Development on its second session;

(b) Decides to transmit the report of the Committee to the Commission on Sustainable Development;

(c) Approves the provisional agenda and documentation for the third session of the Committee set out below:

Provisional agenda and documentation for the third session of the Committee on Energy and Natural Resources for Development

1. Election of officers.

2. Adoption of the agenda and organization of work.

3. Follow-up to the second session of the Committee.

Documentation

Report of the Secretary-General on follow-up to the second session of the Committee

4. Follow-up to the outcome of the ninth session of the Commission on Sustainable Development and contribution to the preparatory process of the 2002 ten-year review of the implementation of the outcome of the United Nations Conference on Environment and Development.

Documentation

A background document to be prepared by the Sub-group on Energy of the Committee

5. Examination of the social, economic and environmental impact of mineral extraction and metal production on integrated land and water management

Documentation

Inter-sessional paper to be provided to the Secretariat by Committee experts

6. Formulation of strategies for the rehabilitation of land and water degradation by mining operations.

Documentation

Inter-sessional paper to be provided to the Secretariat by Committee experts

7. Towards the sustainable exploitation of groundwater.

Documentation

Inter-sessional paper to be provided to the Secretariat by Committee experts

8. Mechanisms for fostering hydro-solidarity.

9. Key issues related to wetlands and sustainable development.

Documentation

Inter-sessional paper to be provided to the Secretariat by Committee experts

10. Desalinization, hydropower and multi-purpose water development projects.

Documentation

A background paper to be prepared jointly by the Committee in association with the Secretariat

11. Review of salient trends and issues on energy development and use in the context of sustainable development:

(a) Advanced technologies for the modern use of biomass;

Documentation

Report of the Secretary-General on advanced technologies for the modern use of biomass to be prepared by the Secretariat in association with the Sub-group on Energy of the Committee

(b) Update on rural energy;

Documentation

Report of the Secretary-General on the update on rural energy development to be prepared by the Secretariat in association with the Sub-group on Energy of the Committee

(c) Review of financial mechanisms: potential benefits of the establishment of financial intermediary organizations, as well as evaluation of the effectiveness of international financial mechanisms.

Documentation

A background document to be prepared jointly by the Committee in association with the Secretariat

12. Strengthening and coordination of energy activities within the United Nations system.

Documentation

Report of the Secretary-General on the strengthening and coordination of energy activities within the United Nations system to be prepared by the Secretariat in association with the Sub-group on Energy of the Committee

13. Provisional agenda for the fourth session of the Committee.

14. Adoption of the report of the Committee on its third session.

C. Decisions of the Committee brought to the attention of the Council

3. The following decisions, adopted by the Committee, are brought to the attention of the Council.

Decision 2/1
The need to establish linkages between policy makers and professionals working on food security, water security and environmental security

The Committee on Energy and Natural Resources for Development, taking note of the report of the Expert Group Meeting on Strategic Approaches to Freshwater Management held in Harare in January 1998,[2] noting that the issues of water, agriculture and integrated land management were discussed as separate topics at the sixth and eighth sessions of the Commission on Sustainable Development, and aware that policy makers and professionals working on issues of food security, water security, and environmental security need to contribute more directly to policy and management decisions across sectors, decides to invite the Department of Economic and Social Affairs of the United Nations Secretariat to explore the possibility of bringing together professionals, policy makers and resource managers in an expert meeting, as preparation for or follow-up to the ten-year review of the implementation of the outcome of the United Nations Conference on Environment and Development, to contribute to the process of clarifying the interdependencies among food security, water security and environmental security.

Decision 2/2
Water supply and sanitation subsector

The Committee on Energy and Natural Resources for Development, taking note with appreciation of the report of the Secretary-General on the progress made in providing safe water supply and sanitation for all during the 1990s,[3] recalling the recommendations made by the Committee at its first session, and noting with satisfaction that most of its comments and suggestions have been incorporated into the aforementioned report of the Secretary-General:

(a) Draws the attention of the Economic and Social Council to the fact that, while significant progress has been made in urban water supply (93.6 per cent

[2] E/CN.17/1998/2/Add.1.
[3] E/CN.17/2000/13.

coverage globally) and urban sanitation (85.3 per cent coverage globally), the progress in rural water supply (70.7 per cent coverage globally) and rural sanitation (36.5 per cent coverage globally) remains a subject of major concern, and that, further, the situation in Asia, Africa and Latin America (rural sanitation coverage being 29.6 per cent, 43.0 per cent and 43.5 per cent, respectively) remains below expected levels;

(b) Also draws the attention of the Economic and Social Council to issues related to water quality (for example, the incidence of arsenic, flouride and so forth in the rural water supply in some parts of the world) as a major subject of concern;

(c) Supports the following strategies:

(i) Integration of water supply with sanitation and hygiene education;

(ii) A gender dimension of water supply and sanitation including women as guardians of large groups of users;

(iii) Improved information management;

(iv) Integration of water supply and sanitation within the holistic approach to water resources development, management and utilization;

(d) Calls for protection of sources of water and watersheds for ensuring water quality.

Decision 2/3
Strengthening and coordination of the activities of the United Nations system in the field of water resources

The Committee on Energy and Natural Resources for Development, having reviewed the report of the Secretary-General on technical cooperation activities of the United Nations system in the field of water resources,[4] considering the recommendations contained in the report of the Secretary-General on the activities of the organizations of the United Nations system in the field of freshwater resources,[5] which was before the Committee at its first session in 1999, another pertinent document on the subject, taking note of the note by the Secretary-General on the review of the Administrative Committee on Coordination Subcommittee on Water Resources,[6] which contains the outcome of the special session of the Subcommittee on Water Resources held in the Netherlands on 23 March 2000, and aware that the Subcommittee on Water Resources has been entrusted with the task of preparing the forthcoming biennial United Nations *World Water Development Report*, recommends that, in order to strengthen the activities of the United Nations system within the field of water resources, the Administrative Committee on Coordination Subcommittee on Water Resources aim towards better inter-agency coordination at the country and regional levels for the rationalization of project implementation.

[4] E/C.14/2000/10.
[5] E/CN.17/1998/3.
[6] E/CN.17/2000/18.

Decision 2/4
United Nations agency technical reports

The Committee on Energy and Natural Resources for Development, concerned that the high-quality professional and technical reports produced by United Nations agencies are not readily accessible to end-users, especially at the country level, recommends that the Administrative Committee on Coordination Subcommittee on Water Resources explore ways and means of making the technical reports/documents prepared by United Nations agencies readily available through easily retrievable electronic forms.

Decision 2/5
Priorities for action and assessment in water and related areas of Agenda 21 for the ten-year review of the implementation of the outcome of the United Nations Conference on Environment and Development

The Committee on Energy and Natural Resources for Development, recalling Economic and Social Council resolution 1998/46 of 31 July 1998, annex I, section D, in which the Committee was directed, in formulating its programme of work, to take into full account the multi-year programme of work of the Commission on Sustainable Development, so as to ensure that its own work would be structured to contribute to the work of the Commission, and bearing in mind that the Department of Economic and Social Affairs of the United Nations Secretariat is the task manager of chapter 18 of Agenda 21,[7] entitled "Protection of the quality and supply of freshwater resources: application of integrated approaches to the development, management and use of water resources":

(a) Requests the Department of Economic and Social Affairs of the United Nations Secretariat to utilize the text annexed to the present decision for the preparation of its assessments of implementation of Agenda 21 and other inputs for the process of the ten-year review of the implementation of the outcome of the United Nations Conference on Environment and Development;

(b) Also requests the Department of Economic and Social Affairs of the United Nations Secretariat to submit the text annexed to the present decision as an information document to the tenth session of the Commission on Sustainable Development and the event on the ten-year review of the implementation of the outcome of the United Nations Conference on Environment and Development.

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[7] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992*, vol. I, *Resolutions Adopted by the Conference* (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex II).

Annex

Priorities for action and assessment in water and related areas of Agenda 21 for the ten-year review of the implementation of the outcome of the United Nations Conference on Environment and Development

1. Water is integral to sustainable development and, as such, has social, environmental and economic values that are inextricably linked and mutually dependent. Water resources, even when considered in an integrated fashion, cannot be considered separately from food and environmental security. Integration must go beyond water management to integrating land and water use, management and planning for development. Ten years after Rio, Governments, intergovernmental organizations, donors and financial institutions continue to make many decisions on a sectoral basis.

2. In order to overcome such a tendency, we recommend that, in the assessment of the implementation of Agenda 21[8] and in the priorities for future implementation in pursuit of sustainable development, the United Nations, Governments and civil society consider the following.

3. Sustainable development of water resources requires a means to integrate water concerns into development in respect of land use and food security, environmental protection, health, and urban and industrial planning.

4. Policies, legislation, regulations or incentives may be used to promote this integrated approach to land and water management and planning; they may also be used to protect the environment, encourage governmental coordination and the participation of civil society, and determine priorities for assessment and monitoring and capacity-building.

5. For example, policies, using one or more instruments, should be considered to:

(a) Ensure public participation in decision-making and management as appropriate;

(b) Define water quality standards, limit pollution loads and ensure environmental protection;

(c) Establish institutional arrangements for sectoral collaboration in water allocations decisions, and incorporate consideration of the impacts on water of all land use and development decisions;

(d) Encourage water use efficiency and reduce non-point source pollution from agriculture and industry.

I. Environmental protection and concerns

6. Environmental protection and concerns must be among the highest priorities, in regard to water resources. This priority stems from two essential characteristics of water. The first characteristic is the continuous nature of the hydrologic cycle. The use or pollution of water resources upstream will reduce their amount or limit their reuse. The second characteristic is the essential role water has for all living beings. Water is essential for life, including human health and food production and

[8] Ibid.

biodiversity in general. Water is crucial to most economic development and industrial activities. Development, in turn, has ongoing impacts on water resources.

7. *Protection of the headwaters of rivers, of wetlands and of groundwater must be facilitated.* The various efforts to accomplish this objective need to be examined, improved and replicated. Some examples include:

(a) Protection of catchment areas for urban drinking water sources, and hydropower dams;

(b) Management of watersheds with an objective of minimizing sediment load;

(c) Regulation or incentives for the protection of wetlands and use of riparian buffers;

(d) Monitoring of groundwater quality;

(e) Requirements for minimum stream flows to maintain environmental functions.

8. *Pollution caused by human activities must be minimized.* The impacts of pollution on subsequent human use, health, groundwater and biological diversity should not be underestimated. All human activities generate pollution; the following are among the most important sources of pollution:

(a) Industry: clean production schemes to reduce industrial pollution have proved effective in many countries where there are economic incentives to reduce water use and pollution;

(b) Agricultural chemicals: the impacts of agricultural chemicals may be reduced by limiting the availability of the most harmful chemicals and by improving training in the proper use and handling of these chemicals and research and training on topics such as integrated pest and nutrient management, biological pest control and organic agriculture;

(c) Sanitation: untreated waste can be reduced by requiring installation of sanitation services, whenever drinking water is provided. Basic training in sanitation and health is also necessary;

(d) Agricultural sedimentation: agricultural sedimentation can be reduced by providing education and incentives for soil and water conservation and encouraging or requiring riparian buffers;

(e) Landfills and hospital wastes: pollution from landfills and hospital waste can be reduced by encouraging recycling where appropriate and separating toxic wastes. Location, design and management of disposal sites are essential in reducing pollution;

(f) Monitoring of water quality and quantity, including the effects impacts of various water uses is crucial. The resulting information needs to be available to the various branches of government and to civil society. Environmental impact assessments needs to be considered for all new activities. The resulting environmental action plans need to be monitored and their implementation enforced. Local communities must be encouraged to participate in the decision-making processes and in monitoring of water quality and quantity.

II. Institutional arrangements

9. Institutional arrangements, including policy regulations, legislation incentives and agreements, need to be put into place to: prioritize allocation; regulate pollution loads and water quality; ensure a participatory process; define a role for communities in the management of their natural resources; and encourage the establishment of basin-level cooperation and dispute settlement mechanisms.

10. *Participation* by all stakeholders (for example, communities, non-governmental organizations, the private sector and academics), including those not currently provided water services, in water resource decision-making and, where appropriate, in water resources management, should be encouraged. Policies and processes need to be established to encourage participation. Basin-level arrangements should be encouraged to facilitate consultation and cooperation between upstream and downstream land and water users, among various sectors, and between water use and aquatic ecosystems.

11. A much greater effort needs to be made to increase awareness among members of the public of the interdependency between land and water decisions and various aspects of their lives. Efforts should be focused on policy makers and opinion leaders but must also extend to the general public and be incorporated in primary educational programmes. The importance of the protection of the upstream water catchment, and of groundwater and groundwater recharge is essential to integrating land and water use decisions. The linkages between land and water use decisions and the impacts on human health and the survival of biodiversity more generally also need to be highlighted.

12. *Coordination* and consultation among Governments and departments, and among governmental authorities at various levels and representing different geographical locations, need to be facilitated. Mechanisms to achieve this might include establishing coordinating committees or establishing the approval processes for oversight by water or environment ministries in decisions effecting water allocation or quality. National coordinating committees should include ministries with water and land management authority and also those ministries responsible for health, finance, planning and development. The roles of subnational Governments and communities should also be defined, and management parameters and performance indicators established.

13. Special consideration needs to be given to institutional arrangements to prepare for and respond to natural disasters, for example, floods, droughts and so forth. Cooperation among Governments, among government sectors at the various levels of authority and with civil society must be established in order to coordinate preparations for, reduce the impact of, and respond effectively to, natural disasters.

III. Assessment and monitoring

14. Assessment and monitoring of water resources and water uses are essential for rational decision-making. Assessments need to include meteorological, hydrologic, geologic, and groundwater data, including water quality. Averages and totals are not sufficient. Time-series data gathered throughout the year and covering years when moisture is abundant and years when moisture is scarce are also very important. Whenever possible, the community should be encouraged to participate in the gathering of data, although this should be accompanied by training, and standards

must be rigorously maintained. Data should also be returned to communities and stakeholders and should be aggregated and made available throughout the hydrographic basin.

15. Planning land and water resources development requires knowledge of available resources and of current and projected use. To be of maximum use, assessments should also include current and projected demands for water. Special efforts should be made to obtain gender-disaggregated data regarding water use and projected use.

16. To maximize water availability, the efficiency of alternative technologies and of existing distribution systems is also crucial. The efficiency of water uses and technologies should be assessed. Assessments of water use in agricultural productions and of various agricultural technologies should be undertaken in water-deficient regions. The monitoring, maintenance and repair of water distribution systems are also crucial.

IV. Capacity-building

17. Capacity-building is crucial to sustainable development of water resources and the economic, social and environmental sectors that affect water quality and quantity and those that depend upon it. Decision makers and professionals with an understanding of integrated land and water resource management are necessary in planning, development and finance ministries as well as in ministries with responsibility for land- and water-dependent sectors. These sectors include agriculture, forestry, fisheries and environment as well as transportation, energy, mining and health. Training at the subnational level and for communities is also of critical importance.

18. Consideration should also be given to training in decision support modelling and in the preparation and evaluation of environmental impact assessments, especially in assessment of aquatic biodiversity.

19. Gender balance should be considered in training opportunities.

20. Special consideration should also be given to the capacity needs in areas where professional resources in land and water management are being reduced by human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS).

Decision 2/6
Reconciliation of the incompatible interests of water use, land use and ecosystems

The Committee on Energy and Natural Resources for Development, noting the relevance of the inter-sessional issue paper on integrated water resources management — reconciling interests of water use, land use and ecosystems[9] with its message about the need for an integrated land-water-ecosystem approach in integrated water resources management in order to maximize the benefits from water resources for socio-economic development while not compromising fundamental ecological services:

[9] E/C.14/2000/3.

(a) Recommends to the Department of Economic and Social Affairs of the United Nations Secretariat that the above-mentioned inter-sessional issue paper be made available in the preparations for the event on the ten-year review of the implementation of the outcome of the United Nations Conference on Environment and Development with the amendments referred to in chapter III, paragraph 41, of the report of the Committee on its second session;[10]

(b) Also recommends that the following issues should be given due consideration by the Economic and Social Council:

(i) Linkages between land use and water resources that expand a land-use-related decision into a water-related decision. Owing to water's function as a moving solvent, it leaches pollutants originating from land use into groundwater and rivers. At the same time, vegetation and soils are instrumental in influencing both evaporation and groundwater recharge;

(ii) Close linkages between water and ecosystems, terrestrial as well as aquatic;

(iii) The role of water in relation to a number of international conventions where water plays a very key role, including the United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa,[11] the Convention on Biological Diversity[12] and the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention);

(iv) The current development towards upstream-downstream hydro-solidarity in the river basin context by securing cooperation towards maximizing the joint benefits from the water resource.

Decision 2/7
River basin management

The Committee on Energy and Natural Resources for Development, recognizing the need for an integrated approach in river basin management and noting decision 41 of the Commission on Sustainable Development adopted at its sixth session[13] in which the Commission "Encouraged riparian States to cooperate on matters related to international watercourses, whether transboundary or boundary, taking into account appropriate arrangements and/or mechanisms and the interests of all riparian States concerned, relevant to effective development, management, protection and use of water resources";[14] and in which the Commission also "encouraged riparian States concerned, to establish, where appropriate, organizations at the river basin level for the implementation of water management programmes. Within its existing guidelines, the Global Environment Facility (was) invited to consider supporting such developments as part of its international water

[10] *Official Records of the Economic and Social Council, 2000, Supplement No. 12* (E/2000/32).

[11] A/49/84/Add.2, annex, appendix II.

[12] See United Nations Environment Programme, *Convention on Biological Diversity* (Environmental Law and Programme Activity Centre), June 1992.

[13] See *Official Records of the Economic and Social Council, 1998, Supplement No. 9* (E/1998/29), chap. I, sect. B.

[14] Ibid., decision 6/1, para. 10 (b).

portfolio. All these actions should be complemented by activities to support effective national water policies and strategies in the developing countries affected by desertification and drought, particularly those in Africa",[15] decides to draw the attention of the Economic and Social Council to the objectives of the 1997 Convention on the Law of the Non-navigational Uses of International Watercourses,[16] which merits analysis in view of its relevance to land use, as well as access to water and sanitation and environmental questions.

Decision 2/8
Sustainable exploitation of mineral resources

The Committee on Energy and Natural Resources for Development, recalling the resolution relating to minerals contained in paragraph 16 of section D of annex I to Economic and Social Council resolution 1998/46 of 31 July 1998, taking note of the decision contained in section 5 (h) (paragraph 25 of decision 8/3 adopted by the Commission on Sustainable Development at its eighth session[17] on the issue of examination of the social, economic and environmental impacts of minerals extraction and metal production, and formulation of strategies for rehabilitation of land degradation by mining, aware that mining investments have shifted significantly towards developing countries where they may not have adequate regulatory frameworks for sustainable mining, and appreciating the discussions held during the side event entitled "Panel discussion on minerals, metals and rehabilitation in the context of sustainable development" held on 23 August 2000:

(a) Decides to examine, at its third session, the social, economic and environmental impacts of minerals extraction and metal production on integrated land and water management;

(b) Also decides to work towards formulation of strategies for rehabilitation of land and water degradation by mining operations.

D. Recommendations of the Committee brought to the attention of the Council

4. Concerning the key issues formulated by the Ad Hoc Open-Ended Intergovernmental Group of Experts on Energy and Sustainable Development at its first session, the Committee on Energy and Natural Resources for Development makes the following recommendations:

1. Accessibility of energy

1.1 The establishment, where applicable, of an organizational structure and of a governmental agency responsible for sustainable energy development and to promote energy accessibility within the country.

[15] Ibid., para. 10 (c).
[16] General Assembly resolution 51/229 of 21 May 1997, annex.
[17] See *Official Records of the Economic and Social Council, 2000, Supplement No. 9* (E/2000/29), chap. I, sect. B.

1.2 Strengthening, in the interest of achieving market stability, the ongoing international dialogue between producers and consumers of energy fuels, making use of new and innovative mechanisms.

1.3 The launching of a natural gas exploration and development initiative for least developed countries for domestic consumption. The Organization of Petroleum Exporting Countries (OPEC), the Group of Eight (G-8) nations, the World Bank and the regional development banks to be invited to contribute to a revolving fund as a commitment to helping the poorest nations with their energy problems, without interference with market mechanisms. As the least greenhouse gas-emitting of the fossil fuels and a very flexible fuel for non-mobile uses, natural gas would be the best fossil fuel on which to base an international effort on energy security for poor countries.

1.4 The establishment of a network of centres of excellence for the demonstration and dissemination of sustainable energy technologies, on the initiative of the United Nations system and with the help of donor countries, to promote capacity-building. The focus of this network should be on energy and material improvement, renewables, and environmentally sound fossil fuel technologies. To accomplish this, existing national centres may be enhanced or, when needed, new centres created with the aim of achieving a regional role for each of them.

1.5 Encouragement, on national and regional levels, of the interconnection of energy grids between adjacent countries as a way to improve energy accessibility and at the same time improve the economics of operating the grid, with the help of international institutions.

1.6 Where appropriate, the installation of regional energy commissions where national energy ministers can meet regularly to work out regional cooperation and rationalization of energy production, transmission and distribution.

2. Energy efficiency

2.1 On national and regional levels, the establishment of indicative targets for energy efficiency improvements in all sectors of society, associated with cost-effective policies and measures to achieve these targets.

2.2 The establishment of (new) regulatory and market frameworks that recognize the role of energy and material efficiency improvement, both nationally and internationally.

2.3 The set-up of mechanisms to benchmark, among countries, efforts and results of energy efficiency improvement policies as well as the energy efficiency in different economic sectors. This can be used as an instrument to increase awareness and to stimulate private and public sectors to improve and rationalize energy use.

2.4 The creation or assignment, at the national level, of a body responsible for implementing energy efficiency policies. International institutions should support the staffing of those bodies on a regional basis.

2.5 As part of globalization of trade, the formulation of minimum performance standards (with International Organization for Standardization (ISO)

certification), agreed upon internationally, for widely used energy-related products ranging from automobiles to refrigerators.

2.6 Strengthening of research, development and demonstration (R, D&D) budgets in energy efficiency. This is an area of opportunity for important cost-sharing and cooperation between the public and private sectors, and between industrialized and developing countries.

2.7 Strengthening of capacity-building, including education, training and information dissemination, ranging from energy planning to technical engineering, to improve the performance of energy and materials use, on the national and international levels.

2.8 Improved understanding of technical, social and behavioural barriers that limit the market diffusion of new energy-efficient technologies, and the development of incentives to hurdle those barriers.

2.9 Important incentives for energy and materials efficiency will be provided with the establishment of energy prices that reflect real costs, internalizing such factors as environmental and social costs. However, removal of subsidies on unsustainable energy consumption patterns must be arranged carefully so that the price fluctuations do not negatively affect the poor in society.

3. Renewable energy

3.1 The development and implementation of national and regional policies and programmes to create an enabling environment for development and utilization of renewable energy sources and to speed up the use of those sources, covering all sectors of the economy. Mapping of renewable energy sources should receive priority attention in this process.

3.2 Strengthening of R, D&D, and of industrial and organizational capacities in the field of renewable energy utilization, and elimination of obstacles to importing and exporting renewable energy equipment.

3.3 Further expansion of the role of the private sector in disseminating renewable energy technologies, and the implementation of specific incentives and regulatory frameworks, such as obligations to buy or obligations to supply, to stimulate market development of renewable energy technologies.

3.4 On a regional level, exchange of experiences on the use of renewable energy sources, through thematic workshops on a regular basis, focusing on education, training, R, D&D activities, and lessons learned from implementation programmes.

3.5 Greater emphasis on South-South cooperation in the field of renewable energy utilization, and development of concrete programmes to foster such cooperation.

3.6 The use of the World Solar Programme as a vehicle to boost the development and implementation of solar energy technologies. Full implementation of the resolutions of the General Assembly on this programme, and further strengthening of the contents and the institutional setting of the programme are recommended.

4. Advanced fossil fuel technologies

4.1 Enacting governmental policies with incentives to motivate the private sector to develop and deploy technologies that will lead the fossil energy system towards a sustainable future.

4.2 The enhancement of R, D&D in the area of advanced fossil fuel technologies, leading to near-zero emissions, with specific attention to environmental aspects of so-called decarbonization technologies to reduce the emission of carbon dioxide (CO_2).

4.3 The creation of task forces on national and regional levels, in public/private partnership, to stimulate the development and use of advanced and cleaner fossil fuel technologies. Such task forces should assist decision makers and stimulate capacity-building, technology development and transfer arrangements and the provision of soft financing through, inter alia, recourse to funding mechanisms on a regional and global level (like the Global Environment Facility (GEF), the clean development mechanism (CDM) and the pilot phase for activities implemented jointly (AIJ)) under the United Nations Framework Convention on Climate Change.[18] This undertaking would engender the cooperation of Governments and manufacturing industries in a voluntary programme framework for cleaner fossil fuel technology deployment.

4.4 The creation of partnerships between industrialized countries, with ongoing R, D&D efforts in the area of advanced fossil fuel technologies with near-zero emissions, and fossil fuel-rich developing countries, to speed up the dissemination of knowledge on those technologies and to allow realistic evaluation and application of those technologies in different regions.

4.5 Encouragement of broad public participation in activities to decarbonize fossil fuels and flue gases and to sequester CO_2, to inform the public about technologies, impacts and trade-offs involved, and to allow further development and deployment of those activities in a socially acceptable manner.

5. Nuclear energy

5.1 In the field of nuclear energy research and development (R&D), special attention to be given to the development of advanced technologies that address public concerns regarding reactor safety, environmentally safe disposal of high-level nuclear waste and spent fuel, proliferation and costs. More specifically attention is needed for, inter alia, the development of "inherently safe" reactors; the potential and effects of reduction of the lifetime of very long lived waste using separation and transmutation technologies; the development of more proliferation-resistant fuel cycles; and options to reduce the capital costs of nuclear fuel cycles.

5.2 Further actions to be undertaken to strengthen nuclear safety regimes and to improve institutional management strategies. This may include, inter alia, creating strong independent regulatory agencies; establishing a strong safety culture that goes beyond regulation and technical training; improving the

[18] A/AC.237/18 (Part II)/Add.1 and Corr.1, annex I.

effectiveness of national regulatory systems; international oversight by the International Atomic Energy Agency (IAEA); expansion of the Convention on Nuclear Safety;[19] extension and enhancement of the IAEA safeguards system; and promoting the universality of the Treaty on the Non-Proliferation of Nuclear Weapons.[20]

6. Rural energy

6.1 The establishment of a national policy and action plan, and of an enabling legislation and regulatory framework, for rural energy development.

6.2 The establishment of a rural energy agency (REA), or another appropriate body, that becomes the implementing vehicle for all rural energy projects and attraction thereby of funding arrangements to set up a rural energy fund (REF) from cooperating partners to complement budgetary provisions. Staff manning such an agency as REA and operating a fund such as REF have to be appropriately trained through capacity-building programmes. Developed countries can assist in such initiatives.

6.3 In order to accelerate rural energy for sustainable development, it is critical that rural development activities, such as agriculture, transport, health, education and water supply, that have energy requirements, should be integrated through a coordinated mechanism with the agency nationally tasked with addressing their energy needs.

6.4 More active involvement of rural people, particularly women, and their institutions in identifying rural energy problems, and in formulating and implementing plans to overcome them.

6.5 Incorporation of tuition and training in rural energy support services, particularly for the purpose of maintaining rural energy systems, in vocational institutions in the rural provinces and districts that provide agricultural, bricklaying, welding and other such services. National scientific industrial and research and development centres together with technology institutes are recommended to closely work with vocational institutions in the rural areas, to effect technology and skills transfer at the very basic level.

6.6 The stimulation of the private sector to fully participate in the production and maintenance of rural energy support services. In addition, encouragement of business and investment seminars and workshops on rural energy development.

6.7 Encouragement of microfinancing schemes, which have proved to be successful in many developing countries, to facilitate access to affordable modern energy technologies in the rural areas.

6.8 Further enhancement of the provision of soft loans by international lending institutions to Governments for sharing the cost of the development of rural energy infrastructures with private sector investors.

6.9 The launch of a new global initiative, by all appropriate United Nations bodies and other interested organizations, and with the support of donor countries and private industries, to bring electric power to the people in rural and isolated

[19] International Atomic Energy Agency, INFCIRC/449.

[20] United Nations, *Treaty Series*, vol. 729, No. 10485.

areas, based on successes already achieved in applying decentralized renewable energy technologies such as photovoltaic, wind, mini-hydro and biomass in rural areas. This initiative should facilitate the efforts of developing countries in rural energy development.

6.10 Organization of a special session of the Commission on Sustainable Development, or a multi-stakeholder international conference to be planned by, inter alia, the United Nations Development Programme (UNDP), on the development and implementation of rural energy services, devoted to the technical, institutional, operational and financial aspects thereof.

7. Energy and transportation

7.1 The formulation of national policy on sustainable development of the transportation sector, together with actions and institutional arrangements to implement that policy. Such a policy may address the development of the sector as a whole and include, inter alia, an integrated view on land-use and transportation planning, policies on public transportation development, policies and criteria for fuel efficiency improvement, regulation of important environmental emissions of vehicles, R, D&D programmes to support the development of new environmentally sound transportation technologies (like fuel cells) and cleaner fuels, and actions to further develop cooperation with the private sector and the general public.

7.2 A review of taxation and subsidies in the transportation sector to increase the environmental soundness of transportation systems. Subsidies should be removed in a socially acceptable manner.

7.3 A programme of actions, at the international level, targeted at several major cities in various regions of the developing world, to demonstrate and promote policies and actions to mitigate adverse impacts on human health and productivity and environmental quality resulting from transport-related activities in urban areas. This programme may be developed by international cooperation between an appropriate United Nations body, city authorities, urban planners and bilateral and multilateral sources of finance.

8. Recommendations concerning the outcomes of the ninth session of the Commission on Sustainable Development

8.1 To initiate a process that would result in a consensus on a set of common principles to support the formulation and implementation of sustainable energy policies and programmes. See the annex, entitled "Some suggestions on possible common principles", to the recommendations concerning the outcomes of the ninth session of the Commission on Sustainable Development (chap. II, sect. B.8), as considered by the Sub-group on Energy.

8.2 To formulate a programme of actions in the field of "energy and sustainable development", making use, inter alia, of the recommendations of the Committee on the key issues, as a step towards a world sustainable energy programme. This programme could be structured along the following lines:

- The formulation and implementation of sustainable energy policies and plans on national and regional levels;

- The creation of proper market conditions for a sustainable energy future;
- The promotion of R, D&D and innovation in sustainable energy development;
- Improving the performance and efficiency of energy use;
- Rural energy development (leading to a world programme on rural energy development);
- Cooperation in sustainable energy development.

8.3 To establish a mechanism to ensure effective implementation of this programme.

8.4 The outputs of the ninth session of the Commission on Sustainable Development as well as the outputs of the Committee to be integrated into the preparatory process for the ten-year review of the implementation of the outcome of the United Nations Conference on Environment and Development.

9. Other recommendations

9.1 Development of a mechanism to update the *World Energy Assessment* on a regular basis, including careful consideration of regional aspects.

9.2 Establishment of a task force on energy within the United Nations system, inter alia, to improve the coordination and cooperation on energy activities within the United Nations system, based on the experiences of the informal Ad Hoc Inter-Agency Group on Energy and the Ad Hoc Inter-Agency Task Force on Energy. This task force to be preferably mandated by the General Assembly, taking into account the coordinating role of the Economic and Social Council. The task force could play a role in implementing decisions and/or recommendations of the Commission on Sustainable Development with respect to energy. The task force could also address items deemed important by the Committee or activities to be undertaken by the Committee.

Chapter II

Items considered by the Sub-group on Energy

A. Follow-up to the first session of the Committee

1. The Committee considered item 7 of its agenda at the 1st and 3rd meetings of its Sub-group on Energy, on 14 and 15 August 2000, and at its 3rd meeting, on 25 August 2000. It had before it the report of the Secretary-General on the follow-up to the first session of the Committee on Energy and Natural Resources for Development: energy sector (E/C.14/2000/7).

2. At the 1st meeting of the Sub-group on Energy, the Chief, Energy and Transport Branch, Division for Sustainable Development, Department of Economic and Social Affairs of the United Nations Secretariat, made an introductory statement.

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3. The Committee, at its first session, following deliberations by the Sub-group on Energy, had adopted a decision entitled "Contribution to the preparatory process for the ninth session of the Commission on Sustainable Development"[21] brought to the attention of the Economic and Social Council. The Committee identified therein critical issues, options for special attention for a sustainable energy future and policies and measures that should be implemented to achieve a sustainable energy future. The Committee also made recommendations concerning the outcomes of the ninth session of the Commission on Sustainable Development. Furthermore:

(a) The report of the Committee on its first session was reviewed by the Commission on Sustainable Development at its seventh session, held in April 1999, and the Commission recommended that the Economic and Social Council transmit the report to the Commission at its eighth session and to the Ad Hoc Open-Ended Intergovernmental Group of Experts on Energy and Sustainable Development at its first session;

(b) The Economic and Social Council took note of the report of the Committee on its first session and decided to transmit it to the Commission on Sustainable Development at its eighth session;

(c) The Commission on Sustainable Development, at its eighth session, noted with interest the critical issues in energy for sustainable development discussed in the report of the Committee and urged countries to contribute to the preparatory process for the ninth session of the Commission.

4. The Ad Hoc Open-Ended Intergovernmental Group of Experts on Energy and Sustainable Development, at its first session, had before it the report of the Committee on its first session as part of the official documentation submitted, which also included the report of the Secretary-General on energy and sustainable development: key issues (E/CN.17/ESD/2000/3) and the report of the Secretary-General on national submissions (E/CN.17/ESD/2000/2). In the preparation of the report on key issues, the contribution of the Committee to the preparatory process for the ninth session of the Commission was taken into careful consideration. For its

[21] *Official Records of the Economic and Social Council, 1999, Supplement No. 12* (E/1999/32), chap. I, sect. C, decision 1/1.

second session the Ad Hoc Group of Experts decided to take into consideration key issues of energy for sustainable development, namely, (a) accessibility of energy; (b) energy efficiency; (c) renewable energy; (d) advanced fossil fuel technologies; (e) nuclear energy technologies; (f) rural energy; and (g) energy-related issues in transportation, with due consideration given for each issue to the means of implementation, that is to say, capacity-building, technology transfer and financial resources.

5. Since the first session of the Committee, the Ad Hoc Inter-Agency Task Force on Energy had met on three occasions and coordinated work associated with the Committee and the Ad Hoc Group of Experts. The Task Force prepared a "matrix" of activities as a reference for United Nations entities and agencies.

6. The report of the Secretary-General on the World Solar Programme 1996-2005 (A/54/212) was submitted to the General Assembly at its fifty-fourth session. In its resolution 54/215 of 22 December 1999, the Assembly took note with appreciation of the report and decided to include in the provisional agenda of its fifty-fifth session under the item entitled "Environment and sustainable development", a sub-item entitled "Promotion of new and renewable sources of energy, including the implementation of the World Solar Programme 1996-2005". The report of the Secretary-General on the subject (A/55/91) was prepared for submission to the Assembly at its fifty-fifth session.

7. The *World Energy Assessment*,[22] after rigorous editorial and outreach processes, was to be released in September 2000. The *World Energy Assessment* is to serve as an input to the preparatory process for the ninth session of the Commission on Sustainable Development.

8. During the period between the first and second sessions of the Committee, the United Nations system carried out a number of technical cooperation activities in energy, covering a wide range of activities focusing on sustainable development.

9. The Committee noted that some of the critical issues and options for special attention, for a sustainable energy future and policies and measures that should be implemented to achieve it, such as energy and atmospheric emissions, and liberalization and privatization of energy markets, had not been considered in depth by the Ad Hoc Group of Experts at its first session. It felt that the issues that had not been covered were important; and while noting that they were not fully reflected in the report of the Secretary-General on key issues, it understood that the key issues had been determined in consultation with member States and United Nations entities involved in energy-related activities. Some of the Committee members felt that it should be pointed out that the Ad Hoc Group of Experts had not taken fully into account the recommendations of the Committee, although most of the issues in question were apparently either incorporated specifically or included in related topics. The Committee noted that the second session of the Ad Hoc Group of Experts would base its discussions on the key issues of energy for sustainable development identified at its first session; consequently, the scope of those discussions would be broader and less targeted than the Committee had recommended.

[22] New York, United Nations Development Programme, Department of Economic and Social Affairs of the United Nations Secretariat and World Energy Council, 2000.

10. The Committee also noted that, in the preparation of the Secretary-General's report on national submissions for the consideration of the Ad Hoc Group of Experts, only a few countries had responded with their contributions.

11. The Committee also noted that technical assistance programmes in energy were not only established in the context of climate change but essentially based on energy for sustainable development, with such programmes supported by, inter alia, the United Nations funds and programmes, the Global Environment Facility (GEF), and the United Nations Fund for International Partnerships (UNFIP).

12. In connection with the activities of the Ad Hoc Inter-Agency Task Force on Energy, attention was directed to the summary of agenda item 10 (e), entitled "Review of salient trends and issues on energy development and use in the context of sustainable development: coordination of energy activities within the United Nations system", in the latter part of the report thereon (E/C.14/2000/6), for related discussions on the issue. The Committee recommended continued strengthening of coordination and cooperation among United Nations entities in the field of energy. The Committee noted with appreciation the input received from members of the Task Force. This had included a report of the International Atomic Energy Agency (IAEA) on the potential role of nuclear power in a sustainable energy future, prepared at the request of the Committee, following the recommendations of the Committee at its first session.

B. Contribution to the ninth session of the Commission on Sustainable Development and its preparatory process

13. The Committee considered item 8 of its agenda at the 1st, 3rd, 5th and 8th meetings of its Sub-group on Energy, on 14 to 16 and 18 August 2000, and at its 3rd meeting, on 25 August 2000. It had before it the report of the Ad Hoc Open-Ended Intergovernmental Group of Experts on Energy and Sustainable Development (New York, 6-10 March 2000) (E/CN.17/2000/12).

14. At the 1st meeting of the Sub-group on Energy, the Chief, Energy and Transport Branch, made an introductory statement.

15. At the 3rd meeting of the Sub-group on Energy, the Co-Chairmen of the Ad Hoc Open-Ended Intergovernmental Group of Experts on Energy and Sustainable Development made statements, which were followed by a dialogue.

16. At the 5th meeting of the Sub-group on Energy, the Sub-group continued the dialogue with the Co-Chairmen of the Ad Hoc Open-Ended Intergovernmental Group of Experts on Energy and Sustainable Development.

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17. The Secretariat introduced the item, focusing on further activities of the preparatory process. The Co-Chairs of the Ad Hoc Open-Ended Intergovernmental Group of Experts on Energy and Sustainable Development addressed the Sub-group on Energy and briefed the Committee on the outcome of the first session of their Group and its inter-sessional activities.

18. The Committee was informed that the Bureau of the ninth session of the Commission on Sustainable Development had been constituted and that at the ninth session of the Commission the topics of energy, atmosphere and transport would be

considered. The intergovernmental process leading to the ninth session of the Commission would essentially consist of the second session of the Ad Hoc Group of Experts and two inter-sessional Working Group meetings, one of which would be devoted to atmosphere and transport issues. The Bureau of the ninth session of the Commission expected the Ad Hoc Group of Experts to provide the ninth session of the Commission with the substantive report on energy issues. For the consideration of the Ad Hoc Group of Experts at its second session, the Secretariat was preparing a report on energy and sustainable development: options and strategies for action on key issues (E/CN.17/ESD/2001/2).

19. The Committee decided to structure its discussion in line with the key issues identified at the first session of the Ad Hoc Group of Experts, namely:

(a) Accessibility of energy;

(b) Energy efficiency;

(c) Renewable energy;

(d) Advanced fossil fuel technologies;

(e) Rural energy;

(f) Nuclear power;

(g) Energy and transportation.

20. Although the sectoral theme of the ninth session of the Commission on Sustainable Development was atmosphere/energy, the Committee noted that the relation between energy and atmospheric emissions was not being adequately addressed in the preparatory process to the ninth session of the Commission. While this relationship at the global level was addressed by the United Nations Framework Convention on Climate Change,[23] it was not being addressed at the local and regional levels in the preparatory process.

21. Emissions from global energy consumption account for about 80 per cent of anthropogenic atmospheric emissions of particulate matter, greenhouse gases, sulphur dioxide (SO_2) and nitrogen oxides (NO_x), which are chiefly responsible for local and transboundary pollution as well as acid rain. Significant adverse effects on human health and important ecosystem damage result from those emissions, notably greenhouse gases, and their implications for climate change, as well as negative impacts arising from unsustainable energy patterns in industry, agriculture, transportation and residential/commercial sectors.

22. A variety of options have emerged as a result of technological progress, to reduce energy-related atmospheric emissions. While some of the options need further R, D&D, some are available for application:

- Cleaner fossil fuel technologies (integrated coal gasification combined cycle, modern gas turbines and so forth);
- Environmental control measures for capture of pollutants;
- New and renewable energy technologies, particularly solar and wind technologies;

[23] A/AC.237/18 (Part II)/Add.1 and Corr.1, annex I.

- The use of hydrogen and other fuels with reduced environmental impacts, such as alcohols, natural gas and so forth

23. The Committee noted that the case studies being compiled as an input to the preparatory process of the ninth session of the Commission on Sustainable Development could provide input to the formulation of those strategies.

24. The Committee held detailed discussions on the key issues of energy and sustainable development, particularly on options and strategies and their implementation.

1. Accessibility of energy

25. There is a dramatically uneven distribution of income and energy consumption levels between industrialized and developing countries, and among the developing countries themselves. It is estimated that one third of the world's population does not have access to modern energy services, most of the people concerned living in rural areas of developing countries. Furthermore, of those with access to energy services, one third of them have an unreliable supply of the modern energy services. Also, there is a markedly uneven distribution of energy sources of all types at local, national and regional levels. Thus, the problem of energy accessibility, as well as energy security, manifests itself at the international level and also at the national level, and, though closely linked, these two dimensions of the problem are best treated separately.

26. At the international level, the issues relate to security of demand for energy-exporting nations, as well as security of supply for energy-consuming nations, among which the least developed countries are the most vulnerable. Both security of supply and security of demand are necessary to achieve market stability.

27. Future accessibility and security of energy are also related to long-term availability of energy resources. Conventional and non-conventional oil and gas resources could last another 50-100 years and possibly longer. Coal resources could last for centuries and nuclear materials for millennia. Energy from renewable resources is more than three orders of magnitude higher than current global energy use. However, the abundant availability of those resources is of little relevance without consideration of how they can contribute, in a timely fashion, an affordable, environmentally sound and socially acceptable supply of (downstream) energy services for all people.

28. At the national level, while enhanced commercial energy supplies are needed to accelerate economic development leading to improved income distribution, steps must be taken to ensure affordability of commercial energy services by all. According to the *World Energy Assessment*, in order to progress beyond the satisfaction of basic human needs, it is estimated that a minimum of 2 kilowatts (kW) per person is required in order for real economic development to get under way: in comparison per capita energy consumption in Western Europe is about 7 kW and in the United States of America about 12 kW.

29. Achieving affordable and adequate supply of energy for all has to be considered a short- to medium-term objective of sustainable development. Globally, this means that an outlay of about $3 trillion would be needed to ensure modern energy services to rural populations in developing countries, and most of the money is needed for infrastructure development. Yet, the amount spent annually on

increasing accessibility to energy services by rural people is approximately only $40 billion.

30. Electricity assumes an increasing share of the total energy mix, particularly in developing countries. Transportation energy demand is also growing as developing nations advance economically. For electricity generation and transportation fuels and other uses, a variety of sources — imported and local, renewable and fossil — can provide the energy supplies needed. The use of energy to provide these services should be undertaken efficiently. In choosing energy sources, preference should be given in the supply mix, considering comparable economic and environmental costs, to local sources over imported, and to renewable sources over fossil, and of the fossil fuels, natural gas should be the preferred source.

31. If market-driven tendencies for the allocation of resources prevail, the poorest populations are likely never to have access to modern sources of energy. For this reason, Governments have a key role to play, particularly in the context of increased reliability of market signals. Policy makers must recognize the link between energy and sustainable development and put in their agenda, the need to provide modern energy services to all people, especially the poor.

32. At the international level, there are a number of options to enhance energy accessibility and energy security, and to ensure long-term availability of energy resources:

- Countries with energy demand security concerns and those with energy supply security concerns can work to enhance the ongoing producer-consumer dialogue, fostering greater stability;
- Wider adoption, and more effective implementation, of the Energy Charter Treaty[24] which entered into force in 1998 and has been signed by about 50 countries, including the members of the European Union (EU), the Commonwealth of Independent States (CIS), Australia and Japan;
- Extension of national energy transportation grids into regional networks, which would allow power pooling and improved oil and gas shipping;
- Poor countries can seek "favoured" status from some energy suppliers, allowing purchase of energy at below-market rates. However, this arrangement is rarely undertaken, the argument against it being that the facility can provide an opportunity for a country to profit by reselling the discounted energy to third nations;
- Diversifying supply (including both suppliers and energy forms), provided it is economical;
- Avoiding excessive dependence on imports by increasing end-use efficiency and encouraging greater reliance on local energy resources provided these do not involve disproportionate costs or waste scarce resources;
- Increasing national and regional strategic reserves of crude oil and oil products;

[24] Accessed at http://www.encharter.org/English/FullText/Treaty.html, on 26 December 2000.

- Encouraging technology transfers (for example, through joint ventures and public-private partnerships) to developing countries so they can develop local energy resources and improve energy efficiencies;
- Encouraging technological progress with respect to extracting, harvesting and converting the vast available energy resources in a timely fashion for present and future generations.

33. There are also a number of options that would increase energy accessibility and energy security at the national level, most of which relate to government policies. It is noted that a number of these options coincide with those stated in the sections on rural energy and renewable energy. These include policies that:

- Support, with public funding, rural electrification programmes and the introduction of distribution of affordable liquefied petroleum gas for cooking in rural and urban areas;
- Provide decentralized renewable energy systems to rural areas;
- Provide access to the natural gas market through a bottled-gas programme;
- Expand networks for energy carriers such as electric grids and oil and gas pipelines;
- Increase energy costs in urban areas in order to subsidize access to energy in rural areas;
- Mobilize, with incentives to enhance, private sector involvement in the energy market in rural areas;
- Provide grants for local solutions and arrange for financing through concessional loans to promote the delivery of modern energy services to the poor;
- Allocate resources to finance the infrastructure needed to provide energy accessibility to the poor;
- Identify local sources of energy, renewable as well as fossil, and select the most judicious mix for development and utilization;
- Promote the provision of energy to income-generating activities for poor populations;
- Pursue raising awareness and improve education programmes;
- Ensure full participation of beneficiaries in choosing the solution for each community;
- Establish a government agency to promote energy accessibility within the country.

2. Energy efficiency

34. A major improvement in energy efficiency would strongly reduce the high capital and environmental costs associated with energy development. It would also increase security of energy supplies, and allow better access to energy resources including renewable sources of energy. Therefore, accelerating energy efficiency

improvement — and related material efficiency improvement (especially materials that are energy-intensive) — is an essential element of sustainable energy policies.

35. The goal of energy efficiency improvement is to use less energy for the same service, at both supply and end-use. At the global level, approximately 37 per cent of primary energy consumption is converted to useful energy: of global annual primary energy consumption of 400 exajoules, 150 exajoules are consumed as useful energy and 250 exajoules are wasted. In terms of exergy (capacity to work) of primary energy relative to the exergy needed by useful energy to deliver the required energy services, the efficiency of energy systems in industrialized countries is less than 15 per cent. Thus, there exists an enormous potential for efficiency improvement.

36. New investments and development of technology normally would lead to an increase in energy efficiency of less than 1 per cent a year. Creating an enabling and stimulating environment by Governments and stakeholders can possibly increase efficiency to 2 per cent per year or more: this has been demonstrated by various companies and sectors in a number of countries.

37. Detailed analyses have shown that the primary energy required for a given level of energy services could be cost-effectively reduced by 25-35 per cent in industrialized countries. Reductions of more than 40 per cent can be achieved cost-effectively in economies in transition. In developing countries, efficiency may be improved by more than 45 per cent. Thus efficiency improvements of 1.5 per cent and up to 2 per cent a year can be achieved. How much of this potential will be realized depends on the effectiveness of policy frameworks and measures, changes in attitudes and behaviour, and the level of entrepreneurial activity.

38. Less energy- and material-intensive production and consumption can contribute to a reduced or zero growth of energy consumption in industrialized countries. In developing countries, however, one should expect significant increases in energy consumption associated with the higher economic growth rates needed. Thus, energy use worldwide will continue to increase, even with the highest levels of efficiency.

39. A number of barriers will have to be overcome in the move towards more efficient use of energy and materials. The barriers concern, inter alia, financial issues, capability enhancement, and lack of awareness and information, as well as policy implementation. The principal barriers to energy efficiency implementation are:

- Lack of awareness on the part of Governments, entrepreneurs and the public of the potential of energy and material efficiency to contribute to lowering energy costs, increasing energy security, improving energy accessibility and reducing environmental emissions;
- Lack of priority placed on energy and material efficiency as part of development policies, owing to, inter alia, low energy costs and low energy bills;
- Lack of capability to acquire and assess energy and material end-use data, to set targets for efficiency goals, and to prepare and enforce efficiency policies;
- Lack of technical knowledge, training and infrastructures needed to implement efficiency options;

- Lack of project developers (such as energy service companies);
- Lack of project financing for efficiency improvement;
- Uncertainties about the performance of investments in new, efficient technologies;
- Lack of incentives for good housekeeping including careful maintenance of equipment;
- Lack of incentives for energy companies and utilities to develop and implement demand-side management (DSM) programmes that may delay or make unnecessary future capacity expansion;
- External costs of energy use, not included in energy prices;
- Patterns and habits of consumers, operators and decision makers;
- Lack of R, D&D to develop new options and to enhance the attractiveness of existing options to improve efficiencies.

40. The goal of speeding up the implementation of energy and material efficiency options can be attained as follows:

- Effective competition in energy supply, including issues related to energy pricing;
- Facilitating financial requirements for energy investments, unimpeded by institutional barriers;
- Maintaining internally consistent energy policies and measures, through institutional and legal arrangements;
- Providing incentives to accelerate energy and material efficiency;
- Promulgating comprehensive and tighter efficiency and emission standards.

41. Major strategies for achieving these goals are as follows:

(a) Establishment, where applicable, of an organizational structure responsible for sustainable energy development, in each country and region;

(b) Development, by each country and region, of sustainable energy policy plans as well as skills, measures and means to implement these plans. Successful implementation will require involvement of decision makers in the development of plans, availability of appropriate financial and technical resources, and participation of all stakeholders, including end-users;

(c) Establishment of financial intermediary organizations at the national level to channel financial flows to projects, commercial banks, industries, energy service companies and non-governmental organizations that are involved in implementing energy efficiency measures and technologies;

(d) Governments will have to participate through the conduct of energy end-use surveys as well as surveys of the efficiency of energy and material uses, and the formulation and implementation of incentives to speed up cost-effective energy efficiency improvements. This may include the creation of an infrastructure for efficiency improvement, setting energy efficiency standards, labelling of appliances, and development of financial measures and incentives. It may also include the

development and implementation of a system to realize, monitor and control long-term agreements on efficiency improvement with major consumers. Attention should also be given to the potential of demand-side management and integrated resource planning.

42. Concerning the improvement of energy use efficiencies in buildings, industry and transportation, inter alia, the following measures have been applied successfully:

(a) Several countries have formulated a comprehensive national energy code for buildings, as well as minimum energy efficiency standards and labels for appliances and lighting. Codes and standards are perhaps the most cost-effective means of achieving energy savings in the built environment. The codes and standards should cover, among other things, thermal insulation of walls, passive cooling and heating, lighting, ventilation, space and water heating, air conditioning, and refrigeration;

(b) In nearly all industries, the efficiency of boilers and furnaces, heating, cooling, drying and condensation, ventilation and air conditioning, and lighting, as well as electricity use, can be improved considerably, inter alia, by combined heat and power production, using standard-setting, levies and long-term agreements;

(c) In the transport sector, consumers seem willing to trade fuel economy for power, comfort, safety and convenience. To counteract this, some Governments have emphasized fuel efficiency in vehicles, imposing standards or higher taxation on vehicles with larger engines. There is now a need for a worldwide protocol on standards for automobile efficiency. There is also a need for energy-efficient public transport systems and the adoption of traffic management schemes.

43. In summary, a wide range of policy instruments, action plans and innovative approaches need to be developed and implemented to achieve desired energy efficiency. At the national level:

(a) Enhance public awareness of the technical options for energy and materials efficiency improvement. Such information is to be made available and accessible;

(b) Encourage local entrepreneurs to provide expertise as well as capital to fund energy efficiency projects. Foster the role of energy service companies, utilities, project developers/implementers, agents of financing in implementing energy efficiency;

(c) Implement policies affecting energy efficiency in agriculture, buildings, industry and transport;

(d) Encourage energy audits of commercial buildings and industrial activities. Efficiency improvements will also occur in industry and commercial buildings with pressure from the utility company for higher electricity costs during peak demand periods;

(e) Consumers respond to incentives, thus it is important to create incentive programmes in energy efficiency ensuring that social benefits exceed costs;

(f) The energy sector should be induced to adopt integrated resource planning to evaluate all options available for meeting energy source needs, taking into account the potential of demand-side management;

(g) Because cost is important in driving change, Governments should consider reducing tariffs and other barriers to the import (and export) of energy-efficient technologies;

(h) Among specific measures of importance in national policy instruments on energy efficiency are efficiency standards, externality taxes and incentives, appliance standards and labelling, and improving international cooperation and linkages in trade, energy sustainability and environment.

44. At the regional and international level:

(a) Strengthen regional energy networks through programmes of information exchange and access to the resources and data of regional agencies;

(b) Develop appropriate data for the establishment of energy efficiency benchmarks;

(c) Establish collaboration frameworks to facilitate the development of regional projects and programmes;

(d) Develop long-term standards for energy efficiency of appliances and commodities;

(e) Establish regional "virtual" centres of excellence on energy efficiency (and renewables);

(f) Provide international expertise and technical assistance in all aspects of energy efficiency, technologies and their implementation.

3. Renewable energy

45. The share of renewable sources of energy in the global primary energy supply mix is at present about 14 per cent (2 per cent large hydropower, 2 per cent modern renewables, including modern biomass, and 10 per cent traditional biomass). The dominant traditional use of biomass, particularly in developing countries, is as firewood for cooking and heating. Some of the traditional uses of biomass are not sustainable because they may deprive soils of needed nutrients, and cause indoor and outdoor air pollution with significant health impacts. They may also contribute to greenhouse gas emissions and affect ecosystems.

46. Sustainable use of renewable energy sources can contribute significantly to the present world energy demand. Scenario studies of potential contribution of renewables to global energy supplies indicate a range from nearly 20 to more than 50 per cent in the second half of the twenty-first century. Much will depend on production costs of energy carriers from renewables and fossil fuel energy supplies, and the regulatory environment, especially for greenhouse gases. For the next few decades, the use of renewables should be viewed as complementary to fossil fuels use, especially in terms of their role in addressing the energy needs of 2 billion people without access to electricity and other modern energy carriers.

47. There is a need for a progressively increasing role for sources of renewable energy in the future, motivated by the following factors:

(a) It could provide commercially attractive options to meet specific needs for energy services, particularly in developing countries and rural areas;

(b) It would enhance diversity in energy supply markets, improving energy security;

(c) It could reduce the dependence on energy imports;

(d) It would secure long-term sustainable energy supplies;

(e) It would help to minimize major environmental impacts of present energy supplies;

(f) It would create new employment opportunities and offer possibilities for local manufacturing of equipment.

48. Proper mapping of renewable energy resources is lacking in many areas. As this information at national and regional levels is vital for their development, specific activities should be encouraged to fill this gap. Such information has led to successful development of renewable energy sources in many parts of the world: wind power generation, geothermal heat and power production, solar home systems to produce electricity in remote areas, solar water heating systems and the successful application of modern biomass systems for district heating and power generation as well as the production of modern fuels in many developing and industrialized countries.

49. Many renewable energy technologies are still at an early stage of development. Moreover, few renewable energy technologies can compete with conventional fuel technologies, except in niche markets and remote areas. Clearly, the production costs have to come down. This will require continuing research, development and demonstration, as well as market development, closing gaps and making renewables increasingly competitive. In addition, new major national and international initiatives are needed to speed up the development and utilization of renewable energy sources worldwide. In this context, full attention should be given to the development of the World Solar Programme and the implementation of the related General Assembly resolution 54/215.

50. While renewable energy development faces many constraints and barriers at the local levels, economic factors remain the main barrier in most cases and often subsidies are needed in one form or another in order for them to compete with conventional energy sources. Barriers that require attention are:

- Lack of enabling national policies, regulatory and legislative frameworks, transparency of rules, efficient decision-making by authorities;
- High initial cost of investment and, in some cases, long lead times for project development and sometimes higher risks in construction and performance;
- Lack of financial arrangements at national levels and cumbersome processes at international levels for financing of renewable energy projects;
- Inadequate institutional and human resources capacity;
- Lack of skills at local levels to properly operate and maintain systems;
- Limited R&D and technological capability;
- Lack of local manufacturing capability.

51. The following options can be applied to reduce or overcome those barriers:

(a) The development and implementation of national and regional policies and programmes to speed up the use of renewable energy sources, covering all sectors of the economy with due consideration to removing the barriers stated above: mapping of renewable energy resources should receive priority attention in this process;

(b) Efforts should be made to intensify R, D&D, strengthen industrial and organizational capacities, and eliminate obstacles to import and export of renewable energy equipment;

(c) The role of private sector should be further expanded and specific incentives should be introduced to facilitate market development;

(d) Further reduction of subsidies to conventional energy — estimated at $100 billion to $200 billion a year — and internalizing external costs would help to create a level playing field for renewables;

(e) Incentives like obligations to buy (example: the United Kingdom Non-Fossil Fuel Obligation) or obligations to supply (renewable portfolio standards) would help to promote renewables;

(f) At the regional level, exchange of experiences should be encouraged through support for thematic workshops focusing on education, training and research;

(g) Greater emphasis should be placed on South-South cooperation and concrete programmes should be developed to foster such cooperation;

(h) Consideration should be given to either strengthening of existing regional institutions or establishment of new regional institutions to promote the use of renewable energy sources, inter alia, by information dissemination, and stimulation of regional cooperation;

(i) Development, at the international level, of coordinated approaches to complex issues such as new financial mechanisms and the development of appropriate renewable energy strategies;

(j) Strengthening of activities within the United Nations system to promote the development and use of renewable sources using advanced technologies and to monitor their application;

(k) Building greater awareness of the potential role of renewables, inter alia, by establishing global awards and prizes for major contributions in renewable energy development.

4. Advanced fossil fuel technologies

52. Reserves and resources of fossil fuels are abundant and they can be exploited at relatively low costs for many decades, assuming further advances in technology for development and use of those fuels. Thus, fossil fuels are expected to play a dominant role in the global energy supply for many decades hence, in all sectors, provided they can be used with low social, economic and environmental costs.

53. Major concerns of widespread use of fossil fuels are:

(a) Security of supply of fossil fuels;

(b) Uneven distribution of fossil fuel reserves and resources;

(c) Costs of fossil fuels and energy carriers derived from them on world markets;

(d) Atmospheric pollution at the local, regional and global levels associated with fossil fuel use, and its impact on health, environment and ecosystems.

54. Scientific, technological and economic progress has made available a wide set of options for cleaner and more efficient production, conversion and use of fossil fuels. Sustainability principles indicate that this progress should further evolve towards the long-term goal of near-zero air pollutant and greenhouse gas emissions. This requires a high rate of innovation in fossil energy technology, guided by public policies.

55. The abundance of natural gas, as well as its economic and environmental advantages, has led to its growing role in the global energy supply mix, notably by increased use of natural gas-fired gas turbines and combined cycles in electricity generation, offering low costs, high efficiency, and low environmental impacts. The current switch to natural gas is expected to increase the share of gas in global energy consumption from 22 per cent in 2000 to 33 per cent within a few decades. Because of its effectiveness, cogeneration of heat and power, using gas turbine and combined cycle technologies, is expected to play a greater role in the energy system. Further development of micro-turbine and fuel cell technologies may allow cogeneration at small scales, for instance, application at the level of apartment buildings. Natural gas can also be used to produce environmentally favourable fuels for the transportation sector.

56. There are existing technologies that will ensure cleaner production, transportation, conversion and end-use processes of oil and oil products. Special emphasis should be given to the transportation sector (vehicular and air transport) where appropriate, for continued gains in the improvements made in petroleum-based fuels, designs and manufacturing processes and standards in automobile and aircraft industries. In addition, further development of advanced fuels and engines for transportation is needed to improve fuel economy substantially and to lower environmental emissions (especially fine particles, NO_x and carbon dioxide (CO_2)).

57. Coal is the most carbon-intensive fossil fuel, and the current trend is a move away from its use. Improved technologies for a cleaner and more efficient production, conversion and use of coal might drive an acceptable shift back to this fuel, taking into consideration its abundance and low cost in many parts of the world (the United States of America, China, India, South Africa and so forth). A key technology will be coal gasification by partial oxidation with oxygen to make syngas (mainly carbon monoxide (CO) and hydrogen). This technology makes it possible to provide electricity through integrated gasifier combined cycle (IGCC) power plants with strongly reduced air pollutant emissions at competitive costs. The technology can also be used to produce from coal super-clean synthetic fuels, including hydrogen (combined with CO_2 sequestration).

58. Strategies for extracting energy from fossil fuels without releasing CO_2 into the atmosphere is being given increased attention because of climate change concerns. The issues involved concern the capacity, security and costs of alternative CO_2 disposal options and the costs of separating the CO_2 from fossil energy systems and preparing it for disposal. The options for disposal include depleted oil and

natural gas fields, deep saline aquifers, deep coal beds and the deep ocean. There is a class of advanced technologies to separate the CO_2 from fossil fuel energy systems, offering considerable promise of high system efficiencies and relatively low CO_2 emission reduction costs. Further development and demonstration of promising technologies to capture and sequester CO_2 are recommended. In addition, a better scientific and technological understanding of the issues involved (effectiveness, safety, costs, capacity and public acceptance) on a region-by-region basis is needed to help policy makers decide on the allocation of resources to further develop and apply CO_2 recovery and disposal techniques.

59. Barriers to near- and long-term deployment of cleaner fossil fuel technologies are their current relative high cost, lack of innovation, lack of both awareness and capacity in many countries to implement advanced technologies, and lack of commitment on the part of decision makers.

60. A number of actions can be identified to speed up the development and deployment of technologies that will lead the fossil energy system towards a future consistent with sustainable development objectives:

(a) Setting long-term goals for advanced fossil fuel technologies, including zero emissions of both air pollutants and greenhouse gases;

(b) Enacting governmental policies with incentives to motivate the private sector to develop and deploy technologies that will lead the fossil energy system towards a sustainable future;

(c) Governmental support for innovation, particularly for long-term research and for early deployment of new fossil fuel technologies that offer major public benefits related to sustainable development;

(d) Major roles for developing countries in the innovation process, to ensure that innovations in cleaner production and use of fossil fuels are tailored to developing country needs;

(e) Governmental guidance and facilitation of new infrastructure development, for example, for natural gas delivery systems in the near term and hydrogen (H_2) delivery systems in the long term;

(f) Fostering international collaboration in the energy innovation process and infrastructure-building activities, for example, via industrial joint ventures;

(g) A better scientific and technical understanding of CO_2 capture and storage options, and of the issues involved, on a region-by-region basis;

(h) Encouraging broad public participation in activities on decarbonization and CO_2-sequestration, to inform the public about technologies, impacts and trade-offs involved, and to allow further development and deployment of these activities in a socially acceptable manner.

5. Nuclear power

61. Nuclear power is a mature technology that has been generating baseload electricity for more than 25 years. At present, nuclear power accounts for 16-17 per cent of total world electricity generation and about 5 per cent of total world energy consumption. In several countries (France, Lithuania and Belgium), nuclear power dominates electricity production; in most countries, the contribution is small or zero.

62. Use of nuclear power has avoided significant amounts of global emissions of CO_2, SO_2, nitrous oxide (N_2O), particulates and volatile organic compounds. It has also helped meet security-of-supply concerns and guard against potentially high escalation of fossil fuel prices. Moreover, there are large natural reserves and resources of uranium and thorium usable for nuclear power. No global shortage is likely to develop for many decades.

63. The short-term prospect for nuclear power is difficult to foresee at best. Most analysts project that nuclear energy's contribution to the global energy budget will not grow and might even decline during the initial decades of the twenty-first century. Nuclear power is more costly than originally projected. Its generating costs often exceed those of competitive alternatives, especially natural gas using combined-cycle turbines. In addition, high upfront costs put nuclear power beyond the reach of many developing countries, at least without absent vendor or government support. Moreover, there has been a loss of public confidence because of concerns related mainly to safety, radioactive waste management, and the potential proliferation of nuclear capabilities for non-peaceful purposes. Technically, however, nuclear power could contribute annually 200 exajoules (EJ) or more to world energy consumption in the second half of the twenty-first century, which would require a 10-fold increase in the installed capacity (up to about 3,500 gigawatts (GW)-electric), as well as in the number of reactors (up to about 4,000).

64. The potential role of nuclear power in a sustainable energy future depends heavily on social acceptability, economic viability and safety of (new) nuclear technologies, as well as the management of spent fuel and nuclear waste, and the impact of the peaceful use of nuclear power on the proliferation of nuclear weapons.

65. Gaining broad public support for nuclear power is not simply a matter of better educating the public on the issues. Nuclear societies and industries must also seek to better understand public concerns. A stable political consensus on nuclear goals and strategies is needed to bring about a nuclear-intensive energy future. Research on public concerns about nuclear energy indicates that broad public support for the application of nuclear power might appear if:

(a) Full consideration is given to the development and application of options to improve energy efficiencies and to the use of renewable energy, as well as advanced fossil fuel technologies;

(b) Nuclear technologies are developed that are safer (if possible, inherently safe), clean and proliferation-resistant;

(c) Trust in nuclear experts as well as in nuclear decision-making processes can be regained. (To this end, opening up the nuclear decision-making process to participation by diverse interest groups should be considered, so that a well-informed public could ensure that its concerns are addressed. Also, it is important that the role of Governments and agencies dealing with the control of nuclear technologies is not merged with activities to promote the use of nuclear energy.)

66. Over the years, new nuclear power plants have become progressively more capital-intensive, taken longer to build than other conventional power generating facilities, involved increasingly prescriptive and cumbersome procurement and entailed longer and costlier regulatory and licensing procedures. All these factors tend to increase financial and commercial risks, and delay innovation. On average, the capital costs for building new nuclear plants of current reactor design can cost

two to four times more than fossil fuel plants, excluding the costs of special measures for decommissioning. The challenge for the industry is to reduce these costs to a generally competitive level on a schedule that assures a large, innovative and self-sustaining industry. Without innovation, nuclear power is unlikely to meet this challenge.

67. The unique public concern about nuclear safety arises from the potential for severe accidents involving the release of substantial quantities of the radionuclides produced in nuclear reactors and causing damage to people, communities, economies and the environment. Two approaches to safety are used in advanced reactor designs, one aiming at evolving improved technology so that the probability of accident sequences with severe core damage or large releases is substantially reduced. However, from a sustainability point of view, an alternative approach may be preferable, namely, one involving the identification and development of technologies that offer a high inherent degree of safety without the need for complicated, capital-intensive safety controls. If these systems can be developed and made to work effectively, they offer the potential to address safety and cost challenges simultaneously. In addition, more emphasis needs to be given to human factors and institutions, and to implementing a strong safety culture that goes beyond regulation and technical training.

68. The challenge for the future is to ensure a consistently high level of safety for a possibly growing number of nuclear facilities in a growing number of countries. Regulation should provide clear boundaries within which safety cannot be compromised. Current efforts to improve the effectiveness of national regulatory systems include stricter separation of regulatory authorities from the governmental institutions responsible for promotional activities. At the international level, the International Atomic Energy Agency (IAEA) is the main organization addressing regulatory issues, with a mandate to establish safety standards and to provide for their application. The major legally binding international instrument addressing nuclear safety is the Convention on Nuclear Safety,[25] which entered into force in 1996. To strengthen the nuclear safety regime, there is need for an international regulatory dimension at several levels. First, safe reliable nuclear power will require institutional mechanisms, such as strong independent regulatory agencies that do not exist today in many countries. Second, because of the potentially far-reaching impacts of nuclear power, international oversight by IAEA on nuclear facilities is needed for the use of nuclear power in all countries. Third, the Convention on Nuclear Safety could be expanded to include international mechanisms for ensuring and even enforcing internationally agreed safety requirements.

69. Perhaps waste management and disposal are the issue where the gap between nuclear supporters and opponents is widest. Many in the industry believe that technical solutions are available but are being blocked politically, while others see this impasse as a reason to discontinue nuclear power. Most concern focuses on the disposal of high-level nuclear waste, the disposition and use of accumulated plutonium, and the storage and disposal of spent fuel. There is a debate over whether waste should be disposed of in a monitorable and retrievable fashion, or whether deep long-term disposal is ultimately preferable, given that there are at present no operational sites for high-level wastes from commercial reactors. There is also debate about whether spent fuel should be reprocessed, disposed of after "once-

[25] IAEA, INFCIRC/449.

through" use, or transmuted to reduce the amounts of long-lived radionuclides thereby obviating part of the waste disposal problem. The opinion of most experts is that technical approaches exist for handling and storing spent fuel to meet the safety requirements applicable in different countries, although there are technical uncertainties that need further study. Others are of the opinion that nuclear power is incompatible with sustainable development because its high-level waste may remain hazardous over tens to hundreds of thousands of years. Further investigation and development of transmutation technologies to reduce the lifetime of high-level waste to hundreds of years might help to resolve this issue.

70. The proliferation of nuclear weapons to include currently non-nuclear-weapon States and/or subnational groups, and the non-universality of the Treaty on the Non-Proliferation of Nuclear Weapons[26] are major issues and potential threats to international peace and security. The greatest technical proliferation concern associated with the peaceful use of nuclear energy is potential access to chemically pure forms of plutonium or highly enriched uranium. Efforts to create a non-proliferation regime through the Treaty and a series of regional treaties, controls on commerce in nuclear materials and goods and services, and safeguards applied to nuclear materials in peaceful nuclear applications have been largely successful in separating peaceful and military uses. If there is to be an energy future in which nuclear power eventually contributes much more than at present, stronger institutional measures will be needed to maintain this separation. These measures will need to be complemented by technological advances aimed at limiting opportunities for acquiring nuclear weapons under the guise of peaceful nuclear energy applications and stealing weapons-usable nuclear materials. An example of a stronger institutional measure could be the extension and enhancement of the IAEA safeguards system, and promotion of the universality of the Treaty on the Non-Proliferation of Nuclear Weapons. Technological options to be investigated may include:

(a) Systems in which plutonium and other weapon-usable materials are never separated from spent fuel, the radioactivity of which deters proliferation and diversion efforts;

(b) Advanced once-through reactor and fuel-cycle technologies for which the quantity of weapons-usable materials available in spent fuel is reduced;

(c) Conversion of nuclear energy to electricity or other energy carriers in large international energy parks, where weapons-usable materials can be maintained under tight international control, and distribution of these carriers to distant consumers.

71. In summary, for nuclear energy to qualify as a sustainable energy option, concerns regarding safety, waste disposal, and proliferation must be addressed in ways that enable nuclear energy to compete on an economic basis. Effectively addressing these concerns is a prerequisite of any consideration of expansion of nuclear power. It probably requires advanced technologies, as well as improved institutional risk management strategies.

72. As a result, in the field of nuclear energy R&D, special attention should be given to the development of advanced technologies that address public concerns

[26] United Nations, *Treaty Series*, vol. 729, No. 10485.

regarding reactor safety, environmentally safe disposal of high-level nuclear waste and spent fuel, proliferation and costs. More specifically attention should be given to, inter alia:

(a) Development of "inherently safe" reactors;

(b) Potential and effects of lifetime reduction of very long lived waste using separation and transmutation technologies;

(c) Development of more proliferation-resistant fuel cycles;

(d) Reduction of capital costs of nuclear fuel cycles.

73. In addition, further actions should be undertaken to strengthen nuclear safety regimes and to improve institutional management strategies. This may include, inter alia:

(a) Creation of strong independent regulatory agencies;

(b) Establishing a strong safety culture that goes beyond regulation and technical training;

(c) Improvement of the effectiveness of national regulatory systems;

(d) International oversight by IAEA;

(e) Expansion of the Convention on Nuclear Safety;

(f) Extension and enhancement of the IAEA safeguards system;

(g) Promoting the universality of the Treaty on the Non-Proliferation of Nuclear Weapons.

6. Rural energy

74. Approximately 2 billion people out of the estimated 3.1 billion living in rural areas have no access to modern energy services. These people largely depend on traditional energy sources for cooking and lighting, such as fuelwood, charcoal, and agricultural and animal wastes, often associated with adverse environmental and health effects at the local level.

75. Energy has a vital role to play in meeting the basic needs of rural households and improving the standard of living. Increased and improved energy supplies can increase and improve food production, water supply, health care, education, and communication. It can also support industrial activity in rural areas, providing local employment. Such developments can also reduce the migration to urban areas. The amount of energy needed to provide the required energy services in rural areas is relatively small, and the total cost is minor relative to that of large electricity generating units (coal, nuclear or hydro power plants).

76. In Agenda 21[27] (chap. 14, para. 14.94) the following objectives of a rural energy transition programme are mentioned:

(a) Not later than the year 2000, to initiate and encourage a process of environmentally sound energy transition in rural communities, from unsustainable

[27] Report of the *United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992*, vol. I, *Resolutions Adopted by the Conference* (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex II.

energy sources, to structured and diversified energy sources by making available alternative new and renewable sources of energy;

(b) To increase the energy inputs available for rural household and agro-industrial needs through planning and appropriate technology transfer and development;

(c) To implement self-reliant rural programmes favouring sustainable development of renewable energy sources and improved energy efficiency.

77. Owing to the dispersed nature of rural populations and the acute poverty of rural inhabitants, difficulties have been encountered in the provision of rural energy services. In fact, national policies aimed at providing modern energy services to rural areas in many countries have focused mainly on extending the national electricity grids, but this has been constrained by the high cost of extending the electric grid to remote locations to supply small loads. Nevertheless, hundreds of millions of people were reached by rural electrification programmes in the past 20-30 years. In addition, hundreds of millions saw their lives improve substantially through the use of better methods for cooking and other energy tasks. Despite these efforts, the unserved population has remained about the same in absolute terms: 2 billion people.

78. Addressing the energy needs of rural populations implies moving from simple biomass fuels to the most convenient, efficient form of energy appropriate to the task at hand. In the case of cooking, for example, it could be a move from fuelwood to kerosene to liquefied petroleum gas (LPG) or other modern fuels and options (electricity, solar heat).

79. Many obstacles exist with respect to the supply of energy from renewable sources, fossil fuels, and rural electrification systems. These need to be overcome in order to attain affordable and sustainable rural energy systems. The following barriers exist:

- Lack of setting clear priorities of rural energy within national policies and plans;
- Relatively higher unit cost of supply;
- Low income levels of rural dwellers;
- Lack of an integrated approach to rural development;
- Weak institutional capacity for project formulation and implementation;
- Lack of regulatory mechanisms and enabling legislation;
- Lack of incentives and access to financial means.

80. The following actions at the national and international levels could go a long way towards addressing the pressing requirements of sustainable development of rural energy:

(a) Giving higher priority to rural energy development within national energy policies and national plans on rural development;

(b) The establishment of an enabling legislation and regulatory framework for rural energy development;

(c) The establishment of a rural energy agency (REA) or an appropriate body that becomes the implementing vehicle for all rural energy projects and thereby attracts funding arrangements (such as with the United Nations Fund for International Partnerships (UNFIP), the Asia Alternative Energy Programme, the Solar Development Group and the Africa Rural Energy Institute) derived from cooperating partners to set up a rural energy fund (REF) to complement budgetary provisions. Staff manning such an agency as REA and accounting for a fund such as REF have to be appropriately trained through capacity-building programmes. Developed countries can assist in such initiatives;

(d) The REA should be tasked to systematically collect information and data on the national and regional availability and use of energy services in the rural areas. This information can be used to monitor progress in providing rural energy and the development of rural energy technologies. It can also be used as feedback to policy design;

(e) Developed countries could establish a (rural) energy agency support programme to assist Governments in establishing (rural) energy agencies, strengthening the managerial capacities of these agencies, and stimulating local research and development activities, and provide funding for demonstration programmes;

(f) Vocational institutions in the rural provinces and districts that provide agricultural, bricklaying, welding and other such services should incorporate tuition and training in rural energy support services, particularly for the purpose of maintaining rural energy systems. National scientific industrial and research and development centres together with technology institutes should closely work with vocational institutions in the rural areas to effect technology and skills transfer at the very basic level;

(g) The private sector should be given incentives to fully participate in the supply and maintenance of rural energy services. Business and investment seminars and workshops on rural energy, particularly in the area of renewables, should be encouraged;

(h) In order to accelerate rural energy for sustainable development, it is critical that rural development activities, such as agriculture, transport, health, education and water supply, that have energy requirements, should be integrated through a coordinated mechanism with the agency nationally tasked with addressing their energy needs;

(i) Microfinancing schemes, which have proved to be successful in many developing countries, should be encouraged in order to facilitate access to affordable modern energy technologies in rural areas. Incentives should be put in place for financial institutions to make capital resources more readily available for small-scale rural energy investments that can generate employment and income;

(j) More active involvement is required of rural people, particularly women, and their institutions in identifying rural energy problems, and in formulating and implementing plans to overcome them;

(k) The launch of a global initiative by all appropriate bodies and other interested organizations, with the support of donor countries, in order to facilitate

the efforts of developing countries to bring electric power to the people in rural and isolated areas;

(l) A special session of the Commission on Sustainable Development, or a multi-stakeholder international conference to be planned by, inter alia, the United Nations Development Programme (UNDP), on the development and implementation of rural energy services devoted to technical, institutional, operational and financial aspects thereof.

7. Energy and transportation

81. The transportation sector is a major consumer of energy. At the global level, the current share of transportation fuels in total energy use is close to 25 per cent: in developed market economies, the share is about 30-35 per cent, and in some other economies, less than 10 per cent. In the past few decades, worldwide transportation energy demand grew at an average annual rate of about 2 per cent per year. In developing countries, the demand growth was more than 5 per cent per year, while in Organisation for Economic Cooperation and Development (OECD) countries, it was about 1.4 per cent per year.

82. The transportation sector relies nearly completely on petroleum-based fuels. Ever-increasing use of energy for transportation all over the world has been the main driver for increased oil consumption over the past few decades. The share of transportation fuels in world oil consumption was 42 per cent in 1973 and 56 per cent in 1997.

83. In the table below, transportation energy demands by mode and modal shares are shown. The table also shows expected development in the transportation sector, based on the global transport study of the World Energy Council (1998). It is expected that, in the period 1995-2020, the growth rate in transportation energy use will be higher in developing countries than in OECD countries, albeit not in absolute terms. This reflects the growing need for mobility in developing countries. Transportation-related problems are probably among the greatest challenges facing the major cities of developing countries. As shown in the table, air transport is expected to be the fastest growing transportation mode in the coming decades.

Forecast of transportation energy demands by mode

	Light-duty vehicles	*Air passenger*	*Trucking*	*Rail*	*Maritime*[a]	*Total*
Transportation energy demand (millions of tons of oil equivalent (MTOE))						
1995	934	151	584	120	129	1 918
2020	1 314	387	978	129	189	2 997
Change	380	236	394	9	60	1 078
Average annual growth rate (percentage)						
1995-2020	1.4	3.8	2.1	0.3	1.5	1.8
Modal share (percentage)						
1995	49	8	30	6	7	100
2020	44	13	33	4	6	100

[a] Including domestic waterborne.

Source: *WEC Statement 2000: Energy for Tomorrow's World* (London, World Energy Council, 1999), p. 155.

84. The transportation sector emits significant amounts of pollutants, including nitrogen oxides (NO_X), volatile organic compounds and lead. Recent studies indicate that the greatest costs associated with health impacts arising from transport sector air pollutant emissions are those stemming from fine particles, both those that are emitted from vehicles directly and nitrate particles formed in the atmosphere from NO_X emissions (*World Energy Assessment*, 2000). It thus appears that concerns about NO_X and particulate emissions will shape, to a large degree, future technological choices for fuel and engine development. Worldwide, the transportation sector accounts for about 23 per cent of CO_2 emissions. Global concerns about these emissions will be another driver for alternative fuels, engine and transportation developments. At present, alternative fuel vehicles are only a small fraction of the total world vehicle stock.

85. New and advanced fuels, engines, cars, transportation systems and approaches are being developed with the aim of improving the performance of the transportation sector in terms of both energy consumption and emission of pollutants, including CO_2. These include, inter alia:

(a) Technologies like the CIDI (compression-ignition direct-injection) hybrid car and the fuel cell car to improve the energy efficiency of cars by a factor of two to three;

(b) Cleaner fuels such as SMD (synthetic middle distillates) and DME (dimethyl ether), and the use of natural gas to strongly reduce the emission of pollutants;

(c) Advanced catalytic converter and tailpipe emission control systems;

(d) Production and use of alternative fuels, such as methanol ethanol, and hydrogen;

(e) Integrated approaches such as the development of (nearly) zero emission vehicles with low fuel consumptions;

(f) Public transportation systems that are effective, affordable and accessible, with easy opportunities for modal shifts;

(g) New communication systems that can help to reduce mobility and the need for transportation.

86. Car manufacturers are putting on the market hybrid cars and plan to accelerate development of commercially viable fuel cell vehicles within the next few years. Given the very large existing stock of motor vehicles using petroleum-based fuels, as well as the difficulties involved in developing new infrastructures or in adapting existing ones, relatively long lead times will be required for alternative fuels and cars to gain an effective market share.

87. Given all the technological options to improve the performance of the transportation sector, the question is whether these improvements will occur — in the absence of stronger regulations and/or very large increases in fuel prices. There is a need for a consistent policy framework for developing advanced fuels and engines for transportation. Elements of such a framework could be:

(a) Integrated planning of land-use and transportation systems, especially in big cities and urban regions, to facilitate access to basic needs (job, school, shops, hospitals and so forth), so that travel needs are reduced;

(b) Promotion of effective, affordable and accessible public transportation and communication systems;

(c) Policies and measures to speed up the development and use of cleaner fuels;

(d) Policies and measures to speed up the development and implementation of cleaner and more efficient cars, buses, trucks and other transportation technologies;

(e) Coordination between fuel and engine development activities, so that new engines are optimized for new fuels;

(f) Specific attention to the development of poly-generation strategies to produce cleaner fuels at lower costs;

(g) Refocusing environmental regulations on, currently, the most important pollutants (like fine particles, NO_X and CO_2);

(h) International cooperation in the development in implementation of cleaner and more efficient transportation systems, especially in urban areas (large cities) in developing countries.

88. Areas for strategic R, D&D are:

(a) Research on lighter vehicles: new, light materials that combine low weight with high safety standards are of special interest;

(b) Research and development of more efficient and less costly fuel cells;

(c) Research and development on important components of electric vehicles, such as batteries, electric motors and gears;

(d) Research and development of electric hybrid vehicles;

(e) Research and development of cleaner fuels;

(f) Further research and development of hydrogen-storage systems;

(g) Research on more energy-efficient aircraft engines;

(h) Research on urban planning issues;

(i) Development of efficient and attractive public transport systems;

(j) Research that improves the understanding of the connections between social and economic development and the demand for transport services;

(k) Research on intelligent highway systems;

(l) Implementation research: how can technologies and approaches for achieving an environmentally sound and energy-efficient transportation system be implemented; how can regulatory and economic incentives be combined to improve the performance of transportation technologies and systems without blocking future socio-economic development?

8. Recommendations concerning the outcomes of the ninth session of the Commission on Sustainable Development

89. The Committee also held discussions concerning the outcomes of the ninth session of the Commission on Sustainable Development and made the following suggestions:

(a) To initiate a process that would result in a consensus on a set of common principles to support the formulation and implementation of sustainable energy policies and programmes (see annex below entitled "Some suggestions on possible common principles");

(b) To formulate a programme of action making use, inter alia, of the recommendations of the Committee on the key issues in chapter I, section D, as a step towards a world sustainable energy programme. This programme could be structured along the following lines:

- Sustainable energy policies formulation;
- Energy efficiency promotion;
- Advanced fossil fuels technologies deployment;
- Rural energy development (leading to the establishment of a world programme on rural energy);

(c) To establish a mechanism to ensure effective implementation of this programme of actions;

(d) That the outputs of the ninth session of the Commission on Sustainable Development be integrated into the preparatory process for the 10-year review of the implementation of the outcome of the United Nations Conference on Environment and Development and in this regard the Commission at its ninth session may wish to request the Committee to contribute to the process.

Annex

Some suggestions on possible common principles

The current energy system is not sustainable:

- That modern fuels and electricity are not universally accessible is an inequity that has moral, political and practical dimensions in a world that is becoming increasingly interconnected;
- The current energy system is not sufficiently reliable or affordable to support widespread economic growth. The productivity of one third of the world's people is compromised by lack of access to commercial energy, and perhaps another third suffer economic hardship and insecurity owing to unreliable energy supplies;
- Negative local, regional and global environmental impacts of energy production, distribution and use threaten the health and well-being of current and future generations.

Steps towards its remodelling according to sustainable development objectives should take into account the following basic features.

General principles for national policy action

1. The combination of sustainable use of traditional energy resources, the increased use of renewable energy sources and a more efficient use of energy could meet the growing needs for energy services in a long-term sustainable way.

2. Governments have the responsibility to conceive and prioritize national energy policies to achieve sustainable development. Policies should aim at combining achievement of public goals and efficient functioning of markets.

3. Governments have the responsibility to make the appropriate institutional arrangements for such policies to be effectively applied.

4. Sustainable energy considerations (such as energy efficiency and renewables) must be integrated in policy-making of major energy consuming sectors such as transport, industry, agriculture, urban planning, and construction, with the participation of the respective stakeholders, when preparing long-life infrastructures which will govern energy consumption patterns for many decades.

5. Governments should promote accurate price signals. Environmental and social costs of energy production, distribution and use should be fully reflected in prices as far as possible. The polluter-pays principle should be applied through internalization of externalities or environmental benefits, inter alia, through energy taxes and by phasing out of energy subsidies when they are harmful (both direct subsidies and implicit subsidies).

6. In order to promote equitable access to energy for all users, adequate regulatory and legal frameworks should be established for enabling private sector initiative and partnership with the public authorities.

7. Cooperation at the regional level between countries with similar resources should be encouraged to build on shared goals, wider markets and experience.

Accessibility and energy security

8. Security of access to energy supply should be treated along the lines of a multisectoral approach, optimally using domestic resources.

9. Temporary subsidies for social purposes may be considered, in such a manner as not to distort the proper functioning of the market.

Energy efficiency

10. Governments should set an example and demonstrate commitment by implementing energy efficiency measures in public buildings and Government-owned enterprises.

11. Specific regulatory measures aimed at increasing energy efficiency should be promulgated at the national level and efficiency standards at the international level.

Renewables

12. The share of renewables in the world energy mix should be steadily increased by appropriate policies at all levels (national, regional, international).

13. The passive use of solar energy should be regarded as a component of renewable energies.

Fossil fuels

14. Given that fossil fuels will continue to play a major role at least through the next few decades, the implementation of currently available cleaner fossil fuel technologies should be widely extended and supported in order to improve sustainability.

15. Energy technologies with near-zero emissions should be developed to ensure long-term sustainability.

Nuclear energy

16. For nuclear energy to qualify as a sustainable energy option, concerns regarding safety, waste disposal end proliferation must be addressed in ways that enable nuclear energy to compete on an economic basis and obtain acceptance from civil society.

Transport

17. Integrated planning of land use and transportation in big cities to facilitate access to basic needs (job, school, shops, hospitals and so forth) is vital in order to reduce the need for travel and the associated captive energy demand and local pollution impacts.

Rural energy

18. Whenever possible, the development of rural energy services should cover electricity as well as basic needs such as those for potable water, cooking fuels and rural income generating activities.

Action taken by the Committee

90. At its 3rd meeting, on 25 August 2000, the Committee had before it an informal paper containing draft recommendations on the accessibility of energy, energy efficiency, renewable energy, advanced fossil fuel technologies, nuclear energy, rural energy, and energy and transportation and on the outcomes of the ninth session of the Commission on Sustainable Development, submitted by the Chairman of the Sub-group on Energy, Mr. Wilhelmus Turkenburg, on the basis of informal consultations.

91. At the same meeting, the Committee adopted the draft recommendations (see chap. I, sect. D, recommendations 1.1-8.4).

C. World energy assessment report: its implication for sustainable energy policy development

92. The Committee considered item 9 of its agenda at the 2nd meeting of the Sub-group on Energy, on 15 August 2000, and at its 3rd meeting, on 25 August 2000.

93. At the 2nd meeting of the Sub-group on Energy, the representative of the United Nations Development Programme made an introductory statement.

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94. A representative of UNDP reported on the progress made in the publication of the *World Energy Assessment* and informed the Committee that the work would be released in September 2000. Following the release of the *World Energy Assessment*, an extensive outreach programme would be launched prior to the ninth session of the Commission on Sustainable Development for wider dissemination of the publication. The *World Energy Assessment* provides analytical background and scientific information for decision makers at all levels. It considers the linkages between the present energy system and major global challenges, including poverty alleviation, health, environmental protection and energy security. Energy resources and technological options are examined in depth. It notes that, over the long term, a variety of new renewable and advanced energy technologies may provide substantial amounts of energy safely, at affordable costs and with near-zero emissions. It examines three scenarios on how the future might unfold using different policy approaches and technical developments. Challenges of bringing affordable energy to rural areas of developing countries are analysed. It points out that creating energy systems that support sustainable development will require policies that take advantage of the market to promote higher energy efficiency, increased use of renewables, and the development and diffusion of cleaner, next-generation energy technologies. Although the market could deliver much of what is needed given proper signals, market forces alone are unlikely to meet the energy needs of poor people or to adequately protect the environment; sustainable development demands frameworks, including consistent policy measures and transparent regulatory regimes, to address those issues.

95. The *World Energy Assessment* points out that there are no fundamental resource, technological, economic and financial constraints on reaching a sustainable energy future. It identifies key strategies and policies needed to move towards a sustainable energy future. They include:

- Setting the right framework conditions, including continued market reforms, consistent regulations and targeted policies, to encourage competition in energy markets, reduce the cost of energy services to end-users, and protect important public benefits;
- Sending accurate price signals, including phasing out subsidies to conventional energy and internalizing some externalities;
- Removing obstacles or providing incentives, as needed, to encourage greater energy efficiency and the development and diffusion to wider markets of new sustainable energy technologies.

96. It also notes that support will be required for capacity-building in developing countries, as these countries and the economies in transition need to further develop

their resources — human, natural and technological — so that they can create energy systems appropriate to their own circumstances. Those countries also need assistance with technology transfer and financing.

97. The Committee was informed that the entire *World Energy Assessment* publication would be posted on the UNDP web site in portable document format (pdf) after the official release of the publication. The overview of the *World Energy Assessment* will be posted in all languages of the United Nations.

98. As regards the Committee's query how outcomes of regional consultations during the publication process had been factored into the *World Energy Assessment*, it was pointed out that the five regional consultative activities were an important part of the process and were designed to have an impact. Lead authors were asked to incorporate regional concerns. Included in the publication are case studies stemming from the regional consultations. However, it should be noted that the *World Energy Assessment* is not a negotiated intergovernmental document: it is more scientific and analytical in nature.

99. The Committee noted that in many areas of the world the lack of access to energy sources was the most important problem. In this context, the link between security of supply and liberalization and privatization in the energy market should be carefully examined. In this regard, the *World Energy Assessment* has indicated the importance of countries' finding ways of collaborating with each other, such as through cross-border trade and cooperation. The same would apply for regional environmental objectives. The case of accessibility of energy supply, especially for rural areas, merited a separate chapter in the *World Energy Assessment* which deals with this in great detail, including issues of the current rules of the game that block provision of services to these areas and a detailed listing of the barriers to providing adequate energy services. The "unserved" people are paying more — a higher proportion of their income — for poor energy services than the other segments of society that are receiving better energy services. The *World Energy Assessment* has made recommendations on how to deal with these problems by removing barriers and improving market conditions.

100. The Committee also noted that the *World Energy Assessment* had more than adequately met its scientific objectives and provided policy decision makers with choices on achieving a viable sustainable energy future. Given that it was not the role of scientists to make policy decisions, the *World Energy Assessment* may lack consideration of decision-making on policy resulting in a list of potential actions.

101. The Committee pointed out that regulation was very important with respect to achieving energy efficiency, especially in this era of deregulation, liberalization and privatization of the energy sector, as was the case in developed countries in respect of their achieving efficiency objectives. Although it was recognized that liberalization and deregulation were important for energy efficiency, it was felt that at the core of the issue was technology transfer to developing countries and economies in transition. The technology to be transferred is often expensive relative to the financial resources of those countries and thus enhanced cooperation is very much needed in technology transfer, including financial support of the transfer.

102. The Committee observed that one multilateral source of financing for energy projects addressing global environmental objectives was the Global Environment

Facility (GEF). Upon ratification of the Kyoto Protocol[28] to the United Nations Framework Convention on Climate Change,[29] the clean development mechanism (CDM) will be another source but it will be driven by global carbon-based concerns. Thus, these two sources of funding may not be beneficial to low carbon emitting developing countries.

103. The Committee noted that ways must be found to provide incentives for the private sector to participate in energy development projects, as public funds for that purpose were clearly inadequate at this point in time. In this connection, it pointed out the need for stable markets and agglomeration of markets in order to buy down the costs through the creation of markets of adequate size, as initial capital requirements for energy development projects are prohibitively high for most developing countries. To be constructive, the debate on financing must move beyond availability of public funds and find the incentives for private sector funding or a mix of public/private funding.

104. It was pointed out by the Committee that certain grouping of countries in the *World Energy Assessment* for analytical purposes might not be entirely appropriate. The countries in the Commonwealth of Independent States (CIS), for example, have been separate not only politically but economically as well for an extended period of time. For that matter, the broad characterization of developing countries may also be inappropriate, given the varied levels of economic and social development of those countries.

105. The Committee was of the view that reviewing the comparative study in the *World Energy Assessment* of different energy technologies and the major achievements possible made it apparent that advanced fossil fuel technologies could provide very interesting opportunities. In this regard, the *World Energy Assessment*, being mindful of the fact that the sustainable energy debate was not about renewables versus conventional energy technologies, gives a balanced treatment thereof. The importance of fossil fuels for many decades to come was acknowledged but stress was placed on more efficient and cleaner use of those fuels.

106. The Committee noted that the question of the role of nuclear power in a sustainable energy future entailed an option that was difficult to evaluate and develop. The *World Energy Assessment*, after discussing the issue, concludes that for nuclear power to qualify as a sustainable energy option, concerns regarding safety, waste disposal and proliferation must be addressed in ways that will enable nuclear energy to compete on an economic basis.

107. The Committee expressed its appreciation of the *World Energy Assessment* and considered it a highly valuable and comprehensive scientific study. The report clearly indicates that energy is a central issue in social, economic and environmental development; therefore, it deserves the attention of Governments at the highest levels. The Committee recommended that a mechanism be developed to update the *World Energy Assessment* on a regular basis, say, every 5 or 10 years, including careful consideration of all regional inputs during the process.

[28] FCCC/CP/1997/7/Add.1, decision 1/CP.3, annex.
[29] A/AC.237/18 (part II)/Add.1 and Corr. 1, annex I.

Action taken by the Committee

108. At its 3rd meeting, on 25 August 2000, the Committee had before it an informal paper containing a draft recommendation submitted by the Chairman of the Committee, Mr. Wilhelmus Turkenburg, on the basis of informal consultations.

109. At the same meeting, the Committee adopted the draft recommendation (see chap. I, sect. D, recommendation 9.1).

D. Review of salient trends and issues on energy development and use in the context of sustainable development

1. Energy and the residential sector

110. The Committee considered item 10 (a) of its agenda at the 4th meeting of its Sub-group on Energy, on 16 August 2000. It had before it the report of the Secretary-General on energy and the residential section (E/C.14/2000/8).

111. At the 4th meeting of the Sub-group on Energy, the representative of the Energy and Transport Branch of the Division for Sustainable Development of the United Nations Secretariat made an introductory statement.

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112. The Committee had before it the report of the Secretary-General on energy and the residential sector (E/C.14/2000/8). The report indicated that total energy demand in the residential sector was expected to grow by 2 per cent per year to 2010 mainly owing to expected increases in population growth, economic growth and the trend towards urbanization. In developing countries, it will increase by 6 per cent per year. Energy is used in the residential sector to provide services relating to climate control, cooking, lighting and the powering of appliances. Electricity is expected to gain in its share in the mix of energy used to provide services to the residential sector in both industrialized and developing countries.

113. Factors affecting energy demand in the residential sector include those related to demographics, economy, lifestyle, culture, attitudes, structure of equipment and buildings, technology, climate and policy factors. Though the residential sector consists of a large number of consumers using similar energy services, there are significant differences across socio-economic groups, regions and countries. Energy used in the residential sector on a per capita basis reflects some of these differences. On a regional basis, per capita energy use is highest in North America at about 30 gigajoules (GJ) per year, though there have been significant decreases in the past 25 years, followed by Europe at approximately 20 GJ per year. In Africa, per capita energy use in this sector has risen slightly in recent years, but remains relatively low at about 10 GJ per year. In Asia and South America, per capita energy use is lower and has remained rather constant at about 5 GJ per year.

114. It was noted that demand-side management policies have been undertaken in many countries and have enjoyed a considerable degree of success. These policies include measures to encourage the provision of energy efficiency information to users of appliances including labelling programmes, the encouragement of voluntary and compulsory standards and the encouragement of the use of compact fluorescent

lamps. Their success has depended on the initial efficiency levels and the incidence of compliance by manufacturers.

115. In the OECD countries, saturation in the demand has been reached for most appliances so that turnover of appliances is more important than absolute growth in appliance use. This, coupled with the fact that the price of energy does not seem to have a strong influence on consumer decisions in these countries, points to applying and regulating technical standards for appliances as an appropriate policy to reduce energy consumption. Generally, residential energy consumption in this group of countries will depend on the continued trend towards individual detached-unit housing, changes in lifestyles and habits, increased efficiency of heating and cooling systems, efficiency in the provision of lighting services, efficiency and use of household appliances and space and water heating needs. In non-OECD European countries, there are problems relating to efficiency of heating systems, including district heating systems, and appliances. Households have been faced with higher energy prices and/or shortages associated with economic adjustment to market reforms. Efforts are under way in some countries to install meters but a restructuring of associated tariffs has yet to be implemented. Non-OECD European countries, in contrast with OECD countries, generally have smaller housing units, a lower incidence of detached dwellings and larger household sizes.

116. The population of developing countries that lives in rural areas consumes traditional fuels including fuelwood and charcoal, animal dung and crop residue. More than 2 billion people live without access to modern energy sources, and their choice of fuel for cooking and lighting often depends on local availability and is associated with adverse health and environmental impacts, especially at the local level. Renewable energy technologies may offer a solution for households in rural and remote areas of developing countries where incomes are low and populations are widely dispersed.

117. Urbanization is associated with higher levels of energy used for cooking, lighting, heating and cooling, and current trends towards urbanization will contribute to higher residential energy consumption in developing countries.

118. Recommendations put forth by the Intergovernmental Panel on Climate Change should serve as guidelines for the mitigation of harmful emissions related to the consumption of electricity and other energy carriers based on the traditional use of fossil fuels and biomass.

119. It is further recommended that regulations and standards be applied to household appliances as part of overall demand management programmes. Where district heating systems are used, greater efforts at improving their efficiency should be undertaken with financial assistance from national Governments. Building codes should be enacted and consistently enforced. Also, recommendations made by the Committee at its first session and by the former Committee on New and Renewable Sources of Energy and on Energy for Development to improve access to energy in rural areas in a manner consistent with sustainable development goals are relevant.

120. The Committee noted that additional investigations into patterns of different types of energy use in the residential sector by category are needed to achieve a better understanding of the trends, and the potential for improvements, in efficiencies. It stressed the need for standards and regulations to improve the efficiencies, given the lack of effectiveness of measures aimed at influencing energy

prices. It also indicated the need for institutional arrangements dedicated to the implementation of energy efficiency measures. Also, there is a need for further R, D&D to reduce the costs of those measures and to develop new options.

121. Significant advances have been made in building construction methods and design to improve building efficiency with regard to energy use, and efforts should be made to encourage their widespread adoption. The application of traditional building designs may also improve energy efficiency of modern structures but further investigations are needed. In this context, the Committee also stressed the need for material efficiency in the residential sector, as it would contribute to the reduction of energy consumption and of the production of waste. Passive solar dwellings are appropriate in many localities and their adoption should be encouraged. Planning ahead to meet the needs associated with increased urbanization is important to ensure that the building envelope has the advantages of currently available energy efficiency building designs and technologies, where appropriate, as well as those yet to be developed. Special attention should be given to the development and implementation of so-called zero-energy buildings.

122. The Committee discussed the potential of changing lifestyles and habits associated with economic development and rising incomes to impact on energy use in the residential sector. It noted that different lifestyles result in different levels of energy consumption. It also noted that a change of lifestyles in order to achieve substantial reductions in the consumption of energy is difficult to achieve. There remains a significant role for the public sector in implementing strategies aimed at the demand for energy services as well as implanting and enforcing regulations to ensure that energy efficient technologies are used. Major stakeholders also have a role to play in supporting energy conservation programmes aimed at this sector.

2. Renewable sources of energy, with special emphasis on solar energy

123. The Committee considered agenda item 10 (b) at the 4th and 6th meetings of the Sub-group on Energy, on 16 and 17 August 2000. It had before it the report of the Secretary-General on renewable sources of energy, with emphasis on solar energy (E/C.14/2000/9).

124. At the 4th meeting of the Sub-group on Energy, on 16 August, the representative of the Energy and Transport Branch of the Division for Sustainable Development of the United Nations Secretariat made an introductory statement.

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125. The Secretariat introduced the Secretary-General's report on renewable sources of energy, with emphasis on solar energy (E/C.14/2000/9). The report highlighted the current status of solar photovoltaic (PV) and solar thermal technologies as well as relevant technical, economic, social and environmental issues; and described major constraints on and barriers to solar energy utilization and indicated that appropriate policies and actions were needed to overcome them and to stimulate wider use of solar energy.

126. The Committee noted that solar energy had the potential to make a significant contribution — albeit a very small contribution at present — to a sustainable energy supply. Most technologies although commercially available were not yet mature and often relatively expensive. Consequently, taking into account the lead times and learning curves involved, it would take many decades before solar technologies

were able to provide a major part of the energy needs in a cost-effective way. However, solar technologies could now play a major role in the energy supply in rural areas, especially in developing countries.

127. The Committee also noted that among the many applications of solar energy discussed in the Secretary-General's report, at present only some could be considered to have been very successful. The application of solar PV technology is one area that holds considerable promise. The Committee also noted that, despite the increased maturity that PV technology had attained in recent years, its share in the total energy mix still remained small compared with, for example, wind energy utilization. Referring to the constraints that still existed, the Committee observed that, inter alia, a lot of effort was needed to bridge the gap between solar cell efficiencies attained in the laboratory and those achieved in module production by the industry and to bring down costs.

128. Noting the impressive growth of PV shipments by a factor of 5 over the last 10 years, the Committee felt that intensive international efforts were needed to substantially increase production volume, as this could have the potential to bring down costs. The focus should be on developing strategies to expand markets for PV systems with emphasis on decentralized rural electrification while strengthening R, D&D to improve the performance of PV systems. Attention should be given to local manufacture of PV systems and for this purpose government and international support would be needed, including support in the form of equity participation. The Committee emphasized the importance of technology transfer that could also be facilitated through joint ventures. Building local R&D capability was considered to be of crucial importance in technology transfer and in its absorption and adaptation.

129. Solar thermal conversion was also noted as a promising area. However, the Committee felt that, in order to achieve wider-scale use of solar thermal technologies, market interventions were necessary. Solar thermal power generation has stagnated for some time at about 400 megawatts (MW). The Committee noted that all solar thermal power generation technologies developed so far faced big challenges particularly with regard to financing of projects. It was also noted that there was not much competition in this area. The Committee observed that although much greater R, D&D effort was needed, this issue had not been adequately addressed in funding mechanism such as the GEF. Greater attention is needed on the part of Governments, industry and financial institutions to address the technical and financing challenges of solar thermal power generation.

130. The Committee felt that data on domestic solar water heater markets were not reported in the literature as regularly as global PV markets. The latest available data report was for the year 1994. Efforts should be made to update this information on a regular basis.

131. The Committee emphasized the importance of introducing regulations in building designs and codes that incorporated passive solar concepts. Necessary steps should be taken to encourage the wider adoption of such practices and to make them cost-effective.

132. The Committee underscored that there was need for increased efforts to support the wider use of solar energy in rural and dispersed areas. Experiences of solar home systems in many countries have been very encouraging. There is need to encourage participatory approaches with the involvement of local community and to

support financially the dissemination of solar and other renewable energy technologies, especially in developing countries. The dissemination of solar cookers, wherever appropriate, should also receive attention and support.

133. Sustained technology partnerships and industrial collaborations were considered essential, as these were means by which developing countries could obviate the problem of importing technologies that might soon become obsolete.

134. Stressing the need for targeted policies and incentives, the Committee noted, however, that differentiating policies and incentives were needed, keeping in view the specific characteristics of different energy technologies. For example, promotion of small-scale PV technologies for individual households may need a set of incentives tailored to these categories of users, whereas different set of policies and incentives might be needed for promotion of grid-connected solar and wind systems where the focus would be on utilities and developers.

135. The Committee noted that one of the first steps that Governments could possibly take to support efforts towards reduction of the high cost of renewable energy systems was investing in R&D and facilitating the import and/or market development of relevant technologies. Entities such as the GEF need to support technology transfer. The Committee felt that the component of technology transfer in GEF-supported projects was not adequate. Also, the domestic component in such projects is small. Therefore, to enhance the effectiveness of such projects, the domestic component also needs to be increased.

136. Highlighting the importance of implementation issues, the Committee felt that there was a need to address these issues comprehensively covering technical, infrastructure, financing, human resources and international cooperation. One of the problems faced in this regard is that government departments and the private sector in many countries handle these matters differently and each in its own way. In some countries, the setting up of scientific research centres for technology incubation has helped in the adaptation of technologies and their local manufacture. Other options could be explored in the form of a separate agency that could be entrusted with the task of building cooperation with other countries and thereby attracting investments. Such an agency could also address specific issues such as public awareness, capacity-building and assistance in manufacturing operations. This kind of institutional issue needs to be addressed at national, regional and international levels. In this connection, examples of national agencies, such as l'Agence de l'environnement et de la maîtrise de l'énergie (ADEME) (the Environment and Energy Management Agency) in France and the Netherlands Agency for Energy and the Environment (Novem), were mentioned.

137. The Committee noted that, in regard to policy recommendations, consideration should be given to "a statement of principles" that could help in evolving shared goals of action at the ninth session of the Commission on Sustainable Development. For example, the statement of principles could include securing a greater share of renewable energy sources in the national energy mix. Another possibility might be provision of information by countries on the extent to which renewable energy would be expected to contribute in each sector at the national level so that such information could stimulate international cooperation.

138. Reference was made to the World Solar Programme 1996-2005, and General Assembly resolution 54/215 in which, inter alia, the Assembly had called for further

action to ensure that the programme was fully integrated into and brought into the mainstream of the efforts of the United Nations system towards attaining the objective of sustainable development. More up-to-date information on the current status of activities under the World Solar Programme was sought from the United Nations Educational, Scientific and Cultural Organization (UNESCO) representative.

139. The Committee recommended that the General Assembly resolution 54/215 on the World Solar Programme 1996-2005, be speedily implemented by fully integrating and bringing the programme into the mainstream of the efforts of the United Nations system towards attaining the objective of sustainable development.

140. The Committee took note of the information provided by the representative of Solar Cookers International (non-governmental organization) on solar cookers, including the possibility of using them for income-generation.

3. New financial mechanisms and economic instruments to speed up the investment in sustainable energy development

141. The Committee considered agenda item 10 (c) at the 6th and 7th meetings of the Sub-group on Energy, on 17 August 2000. It had before it the report of the Secretary-General on financial mechanisms and economic instruments to speed up the investment in sustainable energy development (E/C.14/2000/4).

142. At the 6th meeting of the Sub-group on Energy, on 17 August, the representative of the United Nations Development Programme made an introductory statement.

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143. The Committee had before it the report of the Secretary-General on financial mechanisms and economic instruments to speed up the investment in sustainable energy development (E/C.14/2000/4). The report noted that providing basic energy services to the more than 2 billion people in developing countries currently without access to modern energy sources remained the basic challenge in the provision of energy services.

144. Moreover, an estimated $100-$300 billion/year is required to meet the current overall shortfall in the provision of energy services in developing countries. The World Bank group commitments in the energy sector during 1995-1998 amounted to an average of $3.5 billion/year.

145. Many Governments have initiated reforms aimed at improving regulatory frameworks and institutional set-ups in order to attract private sector funding. Specific policies introduced to induce the flow of investment capital for sustainable energy technologies have been experimented with within a few countries, and other policy instruments are being devised to accelerate the implementation of sustainable energy systems. These include obliging utilities to purchase electricity from qualified independent buyers, requiring that utilities maintain a minimum percentage of renewable energy in the energy mix, and rural electrification concessions.

146. The three most common forms of finance capital are equity, debt and grants. Equity financing is used to fund high-risk/high-return projects, and investors may become closely involved in making project decisions. Sources of equity financing include project developers, venture capitalists, equity fund investors, equipment

suppliers, regional development banks, institutional and individual investors and joint ventures.

147. Debt financing is used for projects with medium risk and medium expected returns. Lenders do not become involved directly in projects. Sources of debt financing are mainly international and national commercial banks, but multilateral development banks, debt/equity investment funds, equipment suppliers, and private investors also provide debt financing. Grant financing is used to promote environmental policies and sources include the GEF, international and bilateral agencies, foundations and national and local agencies.

148. Economic instruments for investment promotion may be used to encourage a faster uptake of sustainable energy in the power supply mix. They include investment tax credits, production tax credits, property tax reductions, accelerated depreciation, direct production incentives, investment assistance and "long-term avoided cost standard offer contracts" for small and distributed projects. In addition, there exist a number of policy and regulatory instruments available to promote investment in sustainable energy.

149. A number of innovative financing models are emerging to help meet the growing demand for the financing of renewable energy projects. They are designed to overcome barriers associated with renewable energy projects. Renewable energy service companies, micro-utilities and cooperatives aim at reducing barriers associated with high initial capital costs for end-users. Other financial models include renewable energy vendor credits, targeted project credits, direct consumer credits, acceptance of equipment as collateral by suppliers, support for project preparation and development and financial bundling.

150. Multilateral financing mechanisms exist or are currently being established that will help support sustainable energy projects. They include FINESSE (Financing Energy Services for Small-Scale End-users), the United Nations Foundation, the World Bank Asia Alternative Energy Programme (ASTAE), the Solar Development Group, the Global Environment Fund, and the Photovoltaic Transformation Initiative. Also, a mechanism is under consideration to reduce greenhouse gas emissions in support of the United Nations Framework Convention on Climate Change, namely, the clean development mechanism.

151. The Committee noted that Governments had a decisive and critical role in providing institutional and technical support, market enabling policy and fiscal incentives, and facilitating the availability of financial resources to promote access to financing for energy projects in line with sustainable development goals. It noted that the effectiveness of the multilateral financial mechanisms might be enhanced with better coordination and evaluation mechanisms. The World Bank lending activities in the area of energy cover only a small fraction of the demand for minimal energy services in developing countries. Therefore, reliance on the private sector is increasing. As private sector funding becomes more significant in financing sustainable energy projects and since there are many risks associated with the development of these projects, ways and means to reduce risk and/or better manage risk must be explored. Since financing is important in achieving a sustainable energy future, strategies and policies to facilitate its expansion must be set up as soon as possible. Furthermore, financing for research and development activities is also needed.

152. It was noted that some international oil companies had undertaken financing of renewable energy projects. Private companies involved in energy activities may be willing to support renewable energy projects and projects that contribute to sustainable energy development under certain economic, regulatory and/or legal environments.

153. Other financing mechanisms, such as joint implementation, as well as the clean development mechanism and tradable permits proposals currently under discussion, might be appropriate in an array of financial mechanisms and instruments to speed up investments in sustainable energy development.

154. The Committee pointed out that, given the current level of subsidization of the production of conventional energy sources of about $250 billion/year, the paucity of funds available for renewable energy projects and other energy projects that would contribute to a sustainable energy future was a barrier which should be overcome. In this regard, it was also noted that private investment in the energy sector by OECD countries totalled approximately $200 billion/year. Governments should ensure that adequate funds were made available at the international, regional and national levels. Furthermore, the current lengthy process in obtaining financing in many multilateral lending institutions should be streamlined.

155. The Committee noted that, while some progress had been made, many of the new financial mechanisms were currently in the gestation stage. It recommended further investigation on and evaluation of the effectiveness of those mechanisms currently in operation at the international level based on a follow-up report on this topic.

156. The Committee also requested a follow-up report on barriers to financing renewable energy projects and other energy projects that would contribute to a sustainable energy future, and possible solutions and options for overcoming those barriers.

4. Promising strategies and initiatives to accelerate the development and implementation of sustainable energy technologies

157. The Committee considered agenda item 10 (d) at the 7th meeting of its Sub-group on Energy, on 17 August 2000.

158. At the 7th meeting of the Sub-group on Energy, on 17 August, the Chief of the Energy and Transport Branch of the Division for Sustainable Development of the United Nations Secretariat made an introductory statement.

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159. The Committee noted that accelerated development and application of environmentally sound energy technologies were crucial in achieving the goals of sustainable development. The world's need for energy is growing steadily day by day, as energy is essential for the growth of prosperity. Economic growth, social development and environmental protection are heavily dependent on sustainable energy supplies. To meet the demands of population growth and its dynamics, poverty alleviation, urbanization, and improved social services, significantly increased levels of energy services will be required. Thus, there is a clear need for promising strategies and initiatives to accelerate the development and

implementation of sustainable energy technologies. Elements of the strategies, among others, are:

- Formulation of clear goals and measurable targets;
- Policies to achieve those goals;
- Measures and instruments (regulatory, action on subsidies and so forth) that would be implemented to achieve those goals;
- Concrete actions.

160. Taking note that there was no formal reporting on the agenda item, the Committee expressed its view that emphasis should be given to promising strategies reflecting different development conditions in various regions and subregions and different sectors of energy use and technologies concerned. The development of strategies should be based on the lessons that can be learned from failures and successes achieved in the past.

161. The Committee felt that approaches like the Energy Charter of the European Union could serve as an example for developing such strategies on a regional level. It noted that international initiatives to accelerate use of sustainable energy technologies depended on the existence of national programmes on energy for sustainable development as well as national agencies addressing those concerns and the existence of a project regulatory framework.

162. The Committee expressed the hope that the ninth session of the Commission on Sustainable Development would result in new strategies and initiatives for sustainable energy development and, in that regard, it also hoped to see clear objectives and time frames for the implementation of such strategies. It noted that the case studies being compiled as an input to the preparatory process of the ninth session of the Commission on Sustainable Development could provide input to the formulation of those strategies. It recommended that during the preparatory process for the ninth session of the Commission on Sustainable Development action be taken to achieve such an outcome.

163. The Committee was of the view that there was a need for a permanent mechanism to evaluate policy instruments, so as to determine the effectiveness of the various policies and measures being implemented, including considerations of accountability in the effective implementation of those policies and measures, and thus lead to a better understanding of them.

5. Coordination of energy activities within the United Nations system

164. The Committee considered agenda item 10 (e) at the 7th and 9th meetings of its Sub-group on Energy, on 17 and 23 August 2000. It had before it the report of the Secretary-General on the coordination of energy activities within the United Nations system (E/C.14/2000/6).

165. At the 7th meeting of the Sub-group on Energy, on 17 August, the Chief of the Energy and Transport Branch of the Division for Sustainable Development of the United Nations Secretariat made an introductory statement.

166. At its 9th meeting, on 23 August, the Sub-group on Energy held a dialogue with the Ad Hoc Inter-Agency Task Force on Energy. The dialogue was opened by the Chairman of the Sub-group on Energy, Mr. Wilhelmus Turkenburg. The

representatives of the United Nations Industrial Development Organization, the United Nations Development Programme, the Economic and Social Commission for Western Asia, the International Atomic Energy Agency and the United Nations Educational, Scientific and Cultural Organization, as well as members of the Sub-group on Energy, participated in the dialogue.

167. Statements were also made by the Director of the Division for Sustainable Development and a representative of the Division for Sustainable Development.

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168. The Committee considered item 10 (e) of the agenda and had before it the report of the Secretary-General on the coordination of energy activities within the United Nations system (E/C.14/2000/6). It indicated that coordination and cooperation on energy activities in the United Nations system had been facilitated by the Ad Hoc Inter-Agency Task Force on Energy, which was organized and chaired by the Department of Economic and Social Affairs. The Task Force had been formally established in 1998 by the Inter-Agency Committee on Sustainable Development to facilitate coordination and cooperation among United Nations entities in energy and related areas in preparation for the ninth session of the Commission on Sustainable Development. It reports directly to the Inter-Agency Committee on Sustainable Development and replaces the Ad Hoc Inter-Agency Group on Energy, which operated on an informal basis from March 1996 to October 1997.

169. The Task Force has focused on coordinating activities in preparation for the ninth session of the Commission on Sustainable Development including the organization of regional meetings on energy and sustainable development and the preparation of case studies as recommended by the Ad Hoc Open-Ended Intergovernmental Group of Experts on Energy and Sustainable Development. Information on the activities of each agency has been arranged in a matrix form, for use as a planning tool by the Task Force. The matrix is a "living" document that is updated periodically as needed. The matrix of activities has been posted on the Department of Economic and Social Affairs web site as a means of providing to the public general information about United Nations activities in the area of energy.

170. The Task Force has made progress in elaborating on a common system-wide approach to energy within the United Nations system and this has been used as an overall guide in its work. The general principles for a common system-wide approach to energy include inclusiveness, complementarity of activities, coordination and information-sharing, and consideration of the advantages and disadvantages of all energy options from a social, economic and environmental perspective. The Task Force has further agreed that work in this area should include the following main elements:

(a) The importance of collection, processing and analysis of data on energy and dissemination of information;

(b) Policies to ensure harmonization of short- and long-term goals for the development and use of energy within a sustainable energy framework;

(c) Identification and strengthening of linkages among economic, social and environmental issues, including ways and means of internalizing external environmental costs associated with energy production and use;

(d) Conversion of broad policy frameworks into specific operational strategies;

(e) Ensuring adequate energy services for both rural and urban households, especially in developing countries;

(f) Establishing and strengthening institutions and building capacity for developing sustainable energy futures;

(g) Access to financing and credits for capacity development and transfer of relevant technologies for sustainable energy.

In addition, the Task Force has agreed that the key issues identified by the Ad Hoc Open-Ended Intergovernmental Group of Experts on Energy and Sustainable Development at its first session in February 2000 are important components of the common system-wide approach.

171. The Committee met with members of the Ad Hoc Inter-Agency Task Force on Energy and heard perspectives and views on current arrangements for coordination in the field of energy as well as activities undertaken as part of the World Solar Programme. There was discussion on the role of the Task Force in light of possible outcomes of the ninth session of the Commission on Sustainable Development and the ten-year review of the implementation of the outcome of the United Nations Conference on Environment and Development.

172. It was the view of the Committee that stronger emphasis should be placed on accelerated coordination and cooperation in the United Nations system. It welcomed the establishment of the Task Force as a positive step and as a follow-up to the informal Ad Hoc Inter-Agency Group on Energy, but was of the opinion that work on the elaboration of a common system-wide approach or a common strategy on energy and sustainable development should be accelerated.

173. While the matrix of activities is useful, it should be expanded to include more detailed information on budgets and programme funding, as well as provide categories of activities such as those identified by the Ad Hoc Open-Ended Intergovernmental Group of Experts on Energy and Sustainable Development at its first session. The Committee encourages all agencies to provide input to the matrix in a timely fashion to facilitate periodic updates.

174. The Committee noted that benchmarks would be a useful tool for evaluating the effectiveness of the Task Force.

175. The Committee indicated that it would welcome the continuation of the Task Force or a similar mechanism after the ninth session of the Commission on Sustainable Development, and that it could act as a vehicle for implementing decisions and/or recommendations of the Commission with respect to energy. Furthermore, the Task Force or a similar mechanism could also address items deemed important by the Committee or activities to be undertaken by the Committee. It should work not only within the context of the Commission but in the larger framework of energy activities undertaken in the United Nations system. Having such a Task Force, preferably as a mandated mechanism under the guidance of the General Assembly, taking into account the coordinating role of the Economic and Social Council, could enhance the coordination and cooperation among United Nations entities in the field of energy for sustainable development. In addition, the possibility exists of evolving a world sustainable energy programme by integrating

United Nations energy activities and those under the World Solar Programme as endorsed by the Assembly.

Action taken by the Committee

176. At its 3rd meeting, on 25 August 2000, the Committee had before it an informal paper containing a draft recommendation submitted by the Chairman of the Committee, Mr. Wilhelmus Turkenburg, on the basis of informal consultations.

177. At the same meeting, the Committee adopted the draft recommendation (see chap. I, sect. D, recommendation 9/2).

Chapter III

Items considered by the Sub-group on Water Resources

A. Review of the reports of the Secretary-General prepared for the eighth session of the Commission on Sustainable Development dealing with the issues of integrated planning and the management of land and water resources

1. The Committee considered agenda item 3 at the 1st to 6th meetings of the Sub-group on Water Resources, on 14 to 17 August 2000, and at the 3rd meeting of the Committee, on 25 August 2000. It had before it the report of the Secretary-General on the progress made in providing safe water supply and sanitation for all during the 1990s (E/CN.17/2000/13), which had been before the Commission on Sustainable Development at its eighth session (24 April-5 May 2000), and the report of the Secretary-General on issues related to the spatial planning of land (including minerals) and water resources (E/C.14/2000/2).

2. At the 1st meeting of the Sub-group on Water Resources, on 14 August, an introductory statement was made by the Chief of the Water, Natural Resources and Small Island Developing States Branch of the Division for Sustainable Development of the United Nations Secretariat.

3. At the 1st to 5th meetings of the Sub-group, from 14 to 17 August, statements were made by the Chairman of the Sub-group, Mr. Ainun Nishat, and by Mr. Aguilar Molina, Mr. Hungspreug, Mr. Kasme, Mr. Kankhulungo, Mr. Matuszak and Mr. Natalchuk.

4. At the 3rd, 4th and 5th meetings of the Sub-group, on 15 and 16 August, statements were made by the observers for Turkey and Egypt.

5. At the 5th meeting of the Sub-group, on 16 August, a statement was made by the observer for Brazil as well as by the representative of the Commonwealth Human Ecology Council, a non-governmental organization in special consultative status with the Economic and Social Council.

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6. The report of the Secretary-General on progress made in providing safe water supply and sanitation for all during the 1990s (E/CN.17/2000/13) had been before the Commission on Sustainable Development at its eighth session (24 April-5 May 2000).

7. Pursuant to the recommendations of the Committee (report on its first session held from 5 to 16 April 1999), the report provides up-to-date information on water supply and sanitation coverage around the world, evaluates the progress made in attaining the ultimate goal of providing safe water supply and sanitation for all and provides proposals for further actions.

8. The Committee noted that during the 1990s some progress in providing safe water supply and sanitation for all had been made, but the goals contained in chapter 18 of Agenda 21 (Rio de Janeiro, 1992) for the year 2000 were far from having been reached.

9. In accordance with the recommendations and comments of the Committee, the report of the Secretary-General on issues related to the spatial planning of land (including minerals) and water resources was revised and updated.

Action taken by the Committee

10. At its 3rd meeting, on 25 August, the Committee had before it an informal paper containing a draft decision entitled "The need to establish linkages between policy makers and professionals working on food security, water security and environmental security", submitted by the Chairman of the Sub-group on Water Resources, on the basis of informal consultations.

11. At the same meeting, the Committee adopted the draft decision (see chap. I, sect. C, decision 2/1).

12. Also at its 3rd meeting, the Committee had before it an informal paper containing a draft decision entitled "Water supply and sanitation subsector", submitted by the Chairman of the Sub-group on Water Resources, on the basis of informal consultations.

13. At the same meeting, the Committee adopted the draft decision (see chap. I, sect. C, decision 2/2).

14. Also at its 3rd meeting, the Committee had before it an informal paper containing a draft decision entitled "Priorities for action and assessment in water and related areas of Agenda 21 for the ten-year review of the implementation of the outcome of the United Nations Conference on Environment and Development", submitted by the Chairman of the Sub-group on Water Resources, on the basis of informal consultations.

15. At the same meeting, the Committee adopted the draft decision (see chap. I, sect. C, decision 2/5).

B. Strengthening and coordination of the activities of the United Nations system in the field of water resources

16. The Committee considered item 5 of its agenda at the 6th meeting of the Sub-group on Water Resources, on 17 August 2000, and at the 3rd meeting of the Committee, on 25 August 2000. It had before it the report of the Secretary-General on technical cooperation activities of the United Nations system in the field of water resources (E/C.14/2000/10).

17. At the 6th meeting of the Sub-group on Water Resources, on 17 August, an introductory statement was made by the Chief of the Natural Resources and Minerals Branch of the Division for Sustainable Development of the United Nations Secretariat.

18. At the same meeting, statements were made by the observers for Egypt and Turkey and by the representative of the Commonwealth Human Ecology Council.

19. Also at the 6th meeting of the Sub-group, statements were made by the Chairman of the Committee, Mr. Ainun Nishat, and by Mr. Aguilar Molina, Mr. Hungspreug, Mr. Kasme, Mr. Kankhulungo, Mr. Matuszak and Mr. Natalchuk.

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20. The report provides information on the technical cooperation activities of the agencies of the United Nations system in the field of water resources undertaken since 1998, touching on the evolution of technical cooperation in water resources and lessons learned over the past decade.

21. The Committee noted that certain achievements had been attained in the strengthening and coordinating of activities of the United Nations system in the field of water resources.

Action taken by the Committee

22. At its 3rd meeting, on 25 August 2000, the Committee had before it an informal paper containing a draft decision entitled "Strengthening and coordination of the activities of the United Nations system in the field of water resources", submitted by the Chairman of the Sub-group on Water Resources, on the basis of informal consultations.

23. At the same meeting, the Committee adopted the draft decision (see chap. I, sect. C, decision 2/3).

24. Also at its 3rd meeting, the Committee had before it an informal paper containing a draft decision entitled "United Nations agency technical reports", submitted by the Chairman of the Sub-group on Water Resources, on the basis of informal consultations.

25. At the same meeting, the Committee adopted the draft decision (see chap. I, sect. C, decision 2/4).

C. Key issues related to the integrated planning and management of land use, ecosystems and freshwater development, use and protection, with special emphasis on the impact of the quantity and quality of shared waters of riparian States

26. The Committee considered agenda item 6 at the 7th meeting of the Sub-group on Water Resources, on 22 August 2000, and at the 3rd meeting of the Committee, on 25 August 2000. It had before it an inter-sessional issue paper on integrated water resources management: reconciling the interests of water use, land use and ecosystems (E/C.14/2000/3).

27. At the 7th meeting of the Sub-group on Water Resources, on 22 August, an introductory statement was made by Ms. Malin Falkenmark, Coordinator of an ad hoc open-ended group of members of the Sub-group.

28. At the same meeting, statements were made by the Chairman of the Sub-group on Water Resources, Mr. Ainun Nishat, and by Mr. Aguilar Molina, Ms. Falkenmark, Mr. Hungspreug, Mr. Makela, Mr. Matuszak and Mr. Natalchuk, as well as by the Chief of the Water, Natural Resources and Small Island Developing

States Branch of the Division for Sustainable Development of the United Nations Secretariat.

29. Also at the same meeting, statements were made by the observers for Turkey and Egypt, as well as by the representative of the Commonwealth Human Ecology Council.

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30. At its first session, in 1999, the Committee had decided to prepare for its second session an inter-sessional issue paper addressing key linkages and strategic issues related to an integrated approach to land use, ecosystems and fresh water resources. The work was entrusted to an open-ended ad hoc group of members, coordinated by Ms. Falkenmark (Sweden).

31. The need to take an integrated approach in river basin management was stressed in chapter 18 of Agenda 21. The paper shows that this should incorporate the deeply interwoven issues of water-dependent land use (including food production for the growing population), water use in many different societal sectors (for survival, health energy production, income-generation and so forth) and crucial ecological services (chemical, such as dentrification; physical, such as enhancement of infiltration and groundwater recharge; and biological, such as pollination, seed dispersal, pest insect control, and fish and meat production).

32. The need for such an integrated approach, incorporating both land use and ecological services, was discussed at the International Water Institute/International Water Resources Association seminar on the theme "Towards upstream/downstream hydro-solidarity", held in Stockholm in August 1999, and a Global Water Partnership Seminar on integrating ecological services into water resources management, held in Stockholm in November 1999.

33. The results of the seminars had been incorporated as a basis for the aforementioned paper. Hydro-solidarity in an upstream/downstream context will have to include attention to both water vapour flows and liquid flow in aquifers and rivers; to land use, water use and ecosystems (terrestrial as well as aquatic); and to the need for reconciling conflicts of interests between water-impacting upstream activities and ecosystems and water-dependent downstream activities and ecosystems.

34. The Committee noted that in the past integrated water resources management efforts had had their focus mainly on the water in rivers and aquifers (blue water), with no particular attention paid to the return flow of evaporated water to the atmosphere (green water). Experience from the semi-arid zone, however, suggests that such an approach is insufficient in regions with high evaporative demand where the run-off is sensitive to land-use changes. Lessons in this regard have been learned in both Australia and South Africa. Integrated water resources management has therefore had to be extended to incorporate both land use and water resources. It was stressed that a land-use decision was also a water decision.

35. The Committee also discussed the relation between ecosystems and water resources and the need advocated in the report of the Expert Group Meeting on Strategic Approaches to Freshwater Management held in Harare in January 1998 (E/CN.17/1998/2/Add.1), to promote an ecosystem approach in integrated water resources management within the river basin framework. Ecosystems are genuinely

water-dependent and interact closely with the passing water. On the one hand, terrestrial ecosystems play a key role in the portioning of rainfall between a flow of evaporated water (green water) and a flow of liquid water (blue water) through rivers and aquifers. On the other hand, aquatic ecosystems depend on the characteristics of the river flow, variability and quality. As regards wetlands, riparian wetlands interact with silt load and nutrients. Riparian wetlands higher up in the catchment are influenced by the precipitation of the groundwater. For these reasons, integrated water resources management has also to pay attention to ecosystems, especially in view of the importance for environmental sustainability of protecting crucial ecological services that are linked to their proper functioning. This also makes integrated water resources management a crucial tool in fulfilling the prescriptions agreed upon by Governments in the Convention on Biological Diversity and the Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat (1971).

36. In its discussion, the Committee stressed that pollutant transport — in view of its influence both on water usability for societal purposes and on aquatic ecosystems — had to be properly entered into the integrated water resources management process.

37. The Committee stressed that the trade-offs that would have to be made in the river basin, owing to interlinkages between upstream and downstream land and water stakeholders and ecosystems, should be guided by hydro-solidarity as an overriding principle. In this regard, the innovative "caring and sharing" approach taken in South Africa — where the principle of upstream-downstream water-sharing had been entered into the new National Water Law, established in 1998 — should be followed with great interest.

38. In the discussion, attention was also drawn both to the provocative question "who owns the rain" as a stimulating and eye-opening question, and to the close interlinkages, through the water cycle, of food security, water security and environmental security, in other words, basic aspects of human security.

39. Moreover, some observers raised some concerns regarding some of the views on sovereignty expressed in the Green Cross International report[30] discussed in paragraph 37 of the inter-sessional issue paper (E/CN.14/2000/3) and on the status of the United Nations Convention on the Law of the Non-navigational Uses of International Watercourses (General Assembly resolution 51/229, annex) discussed in paragraph 39 of the issue paper.

40. The Committee noted that the inter-sessional issue paper provided a basis for discussions on how to support the input to the 10-year review of the implementation of the outcome of the United Nations Conference on Environment and Development, to be held in 2002.

41. The Committee decided that certain amendments were to be made in the inter-sessional paper, as follows:

(a) Figure III: the heading "UPSTREAM STAKEHOLDERS" should be changed to "DOWNSTREAM STAKEHOLDERS";

[30] *National Sovereignty and International Water Courses* (Geneva, 1999).

(b) Paragraph 37: the sentence reading "The report stressed that in transboundary watercourses, both internal and external manifestations of sovereignty are relevant" should be deleted.

42. The Committee recommended that the inter-sessional issue paper be considered a background document in the preparation process for the 10-year review of the implementation of the outcome of the United Nations Conference on Environment and Development.

Action taken by the Committee

43. At its 3rd meeting, on 25 August 2000, the Committee had before it an informal paper containing a draft resolution entitled "Case studies from Governments and international institutions on matters relating to integration of water and land management in the context of Agenda 21 for sustainable development", submitted by the Chairman of the Sub-group on Water Resources, Mr. Ainun Nishat, on the basis of informal consultations.

44. At the same meeting, the Committee adopted the draft resolution (see chap. I, sect. A).

45. Also at its 3rd meeting, the Committee had before it an informal paper containing a draft decision entitled "Reconciliation of the incompatible interests of water use, land use and ecosystems", submitted by the Chairman of the Sub-group on Water Resources, Mr. Nishat, on the basis of informal consultations.

46. At the same meeting, the Committee adopted the draft decision (see chap. I, sect. C, decision 2/6).

47. Also at its 3rd meeting, the Committee had before it an informal paper containing a draft decision entitled "River basin management", submitted by the Chairman of the Sub-group on Water Resources, Mr. Nishat, on the basis of informal consultations.

48. At the same meeting, the Committee adopted the draft decision (see chap. I, sect. C, decision 2/7).

Chapter IV

Outcome of the seventh and eighth sessions of the Commission on Sustainable Development

1. The Committee considered item 4 of its agenda at its 2nd meeting, on 21 August 2000, and heard a statement by the Chief, Natural Resources and Branch of the Division for Sustainable Development of the United Nations Secretariat.

2. At the same meeting, statements were made by Mr. Devin, Ms. Falkenmark, Mr. Mäkelä, Mr. Derogan, Mr. Matuszak, Mr. Aguila Molina, Mr. Boumaour and Mr. Bravo Trejos.

3. A statement was also made by the observer for Egypt.

4. Also at the 2nd meeting, the Chief, Water, Natural Resources and Small Island Developing States Branch, responded to questions raised by the experts.

Chapter V

The multi-purpose use of hydro resources

1. The Committee considered item 11 of its agenda at its 2nd and 3rd meetings, on 21 and 25 August 2000. It had before the report of the Secretary-General on the status of hydroelectricity generation (E/C.14/2000/5).

2. At the 2nd meeting, on 21 August, an introductory statement was made by the representative of the Energy and Transport Branch of the Division for Sustainable Development of the United Nations Secretariat.

3. At the same meeting, statements were made by Mr. Pavlovschi, Mr. Meshref, Mr. Matuszak, Mr. Bravo Trejos, Mr. Ingimarsson, Mr. Nishat, Mr. Zhang Guocheng, Mr. Aguilar Molina, Mr. Natalchuk, Mr. Devin, Ms. Falkenmark, Mr. Derogan, Mr. Ahmad Kahrobaian, Mr. Turkenburg and Mr. Hungspreug.

4. A statement was also made by the Chairman of the Committee.

5. Also at the 2nd meeting, the representative of the Energy and Transport Branch responded to questions raised by the experts.

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6. The Committee in a plenary session considered the report of the Secretary-General on the status of hydroelectricity generation (E/C.14/2000/5), under agenda item 11 on the multi-purpose use of hydro resources. One of the major tasks that developing countries face today is to provide their growing population with reliable and affordable supplies of electricity. Ready access to electricity by all households has come to represent a measure of economic and social progress. It is the availability of indigenous resources that will have the largest influence on fuel choice for generating electricity in the developing world. Given its large potential, hydropower can be expected to contribute significantly to electricity generation in a large number of countries in the developing world, especially in Africa and Asia. Hydropower has the potential to contribute to efforts towards reducing greenhouse gas emissions.

7. Nonetheless, there are environmental and social drawbacks associated with hydropower, especially the effect of dams and reservoirs on river ecosystems. Environmental degradation, such as ecological changes and effects on fish, needs to be addressed. For large-scale hydropower development, population displacement is conspicuous: careful site selection and project design limiting the maximum reservoir level, for example, may minimize that displacement. Also, depending on the size of the hydropower development project, most of the environmental concerns can be mitigated by proper planning, including careful consideration of issues at the planning and implementation stages. Some of the mitigating approaches are:

- Adherence to clear and strict environmental guidelines, both national and those imposed by international lenders;
- Adequate environmental impact assessment;
- Adequate public disclosure and dialogue with all stakeholders;
- A comprehensive environmental mitigation plan;
- Resettlement of displaced persons to a satisfactory level;

• Avoidance of habitats of endangered species.

8. The Committee noted that only about one third of the worldwide potential hydropower resources was currently exploited, albeit the remaining potential varied by region and, in many cases, hydropower was cost-effective compared with thermal power for electricity generation. However, the long lead times and the capital-intensive nature of projects with, more often than not, occurrence of cost overruns, as well as the risks involved — among others, the altering of geographical landscapes and human settlements — effectively discourage private sector involvement. Ways and means to overcome these obstacles become more important as reliance by the electricity industry on the private sector becomes more common in industrialized as well as developing countries.

9. The Committee noted that most of the hydropower projects were multi-purpose projects, with the benefits of irrigation, clean drinking water, navigation and flood control, fisheries, recreation and so forth being as important as hydroelectricity generation. However, there are many social and environmental costs associated with such projects. These costs must be adequately accounted for when evaluating the pros and cons of dam and reservoir construction. Management of upstream basin areas to prevent silt and sediment build-up is also important. Other environmental risks include immersion of cultural heritage and historical sites, and loss of wildlife and biodiversity; hence, aquatic biosystems have to be adequately studied. Thus, environmental and social impacts assessment, including consideration of the aforementioned problems and risks, should be carried out. The Committee agreed that environmental standards at the international level should be established.

10. "Run of the river" technology associated with mini- and micro-hydropower should be considered when and where they prove cost-effective. Small cascading dams may be appropriate in place of one large dam. National Governments should encourage the enhanced use of mini- and micro-hydro facilities, as appropriate, at many rural and remote areas.

11. The Committee indicated that hydropower offered opportunities for "storage" in an integrated system feeding a grid, which could fill the gap from intermittent thermal, solar and wind energy. Utilization of hydropower in peak load management is a major positive aspect of this source of energy.

12. The Committee noted that objections to dams by stakeholders, including major groups and non-governmental organizations, needed to be seriously addressed. However, it was pointed out that perceptions might not be the same in developing countries as in OECD countries where an average of about two thirds of the hydropower potential had been exploited, and that perceptions changed as new information became widely known.

13. The Committee noted that the current work undertaken by the World Commission on Dams was drawing on a wide range of experts and different stakeholders from many different fields and might be useful in developing strategies and policies for consideration in sustainable development policies. The Committee looked forward to the outcome of the work of the World Commission on Dams and noted that the ensuing report might be of value to the Ad Hoc Open-Ended Intergovernmental Group of Experts on Energy and Sustainable Development and the ninth session of the Commission on Sustainable Development. The Committee recommended that this report be made available to those forums.

Chapter VI
Other matters

1. At the initiative of the Committee, a panel discussion on minerals, metals and rehabilitation in the context of sustainable development was held on 23 August 2000 as a side event of the second session of the Committee.

2. The panel discussion was jointly organized by the Department of Economic and Social Affairs of the United Nations Secretariat and the International Council on Metals and the Environment (ICME) to follow-up on Commission on Sustainable Development decision 8/3 on integrated planning and management of land resources.

3. Representatives from Member States, the mining industry, international organizations and non-governmental organizations examined the social, economic and environmental impacts of mineral extraction and metals production.

Action taken by the Committee

4. At its 3rd meeting, on 25 August 2000, the Committee had before it an informal paper containing a draft decision entitled "Sustainable exploitation of mineral resources", submitted by the Chairman of the Sub-group on Water Resources, Mr. Ainun Nishat, on the basis of informal consultations.

5. At the same meeting, the Committee adopted the draft decision (see chap. I, sect. C, decision 2/8).

Chapter VII

Provisional agenda for the third session of the Committee

1. The Committee considered item 12 at its 3rd meeting, on 25 August 2000. It had before it an informal paper containing the draft provisional agenda for its third session.

2. At the same meeting, the Committee decided to approve the provisional agenda and documentation for its third session (see chap. I, sect. B).

Chapter VIII

Adoption of the report of the Committee on its second session

1. The Committee considered item 13 at its 3rd meeting, on 25 August 2000. It had before it the draft report on its second session (E/C.14/2000/L.2 and a number of informal papers).

2. At the same meeting, the Committee decided to approve the draft report (see chap. I, sect. B).

Chapter IX
Organization of the session

A. Opening and duration of the session

1. The Committee on Energy and Natural Resources for Development held its second session at United Nations Headquarters from 14 to 25 August 2000. The Committee held 3 meetings (1st to 3rd) and a number of informal meetings.

2. The session was opened by the Director, Division for Sustainable Development, Department of Economic and Social Affairs of the United Nations Secretariat.

3. In accordance with paragraph 15, annex I, of Economic and Social Council resolution 1998/46 of 31 July 1998 on further measures for the restructuring and revitalization of the United Nations in the economic, social and related fields, the Committee comprised two sub-groups, one on energy and one on water resources. The Sub-group on Energy held 9 meetings and the Sub-group on Water Resources held 7 meetings.

B. Membership and attendance

4. Twenty-one members of the Committee attended the second session: Carlos Alberto Aguilar Molina (El Salvador), Messaoud Boumaour (Algeria), Hernán Bravo Trejos (Costa Rica), Dmytro Victorovych Derogan (Ukraine), Bernard Devin (France), Malin Falkenmark (Sweden), Siripong Hungspreug (Thailand), Jon Ingimarsson (Iceland), Ahmad Kahrobaian (Islamic Republic of Iran), Owen Macdonald Kankhulungo (Malawi), Badr Kasme (Syrian Arab Republic), Christian M. Katsande (Zimbabwe), Markku Juhani Mäkelä (Finland), John Michael Matuszak (United States of America), Wafik Meshref (Egypt), Sergey M. Natalchuk (Russian Federation), Ainun Nishat (Bangladesh), Neculai Pavlovschi (Romania), Wilhelmus C. Turkenburg (Netherlands), Raymond Marcio Wright (Jamaica) and Zhang Guocheng (China).

5. The following States Members of the United Nations were represented by observers: Egypt, Iraq and Turkey.

6. The following United Nations bodies and specialized agencies were represented: United Nations Development Programme and United Nations Educational, Scientific and Cultural Organization.

7. The International Chamber of Commerce, a non-governmental organization in consultative status with the Economic and Social Council, was represented.

C. Election of officers

8. At its 1st meeting, on 14 August, the Committee elected Christian M. Katsande (Zimbabwe) as Chairman by acclamation.

9. At the same meeting, the Committee elected the following officers by acclamation:

Vice-Chairmen

Wilhelmus C. Turkenburg (Netherlands)
Wafik Meshref (Egypt)
Ainun Nishat (Bangladesh)
Sergey M. Natalchuk (Russian Federation)

10. At the same meeting, it was decided that Mr. Turkenburg would serve as Chairman and Mr. Meshref as Rapporteur of the Sub-group on Energy, and that Mr. Nishat would serve as Chairman and Mr. Natalchuk as Rapporteur of the Sub-group on Water Resources.

D. Agenda and organization of work

11. At its 1st meeting, on 14 August, the Committee adopted the provisional agenda for the session as contained in document E/C.14/2000/1, and approved its organization of work as contained in document E/C.14/2000/L.1. The agenda was as follows:

1. Election of officers.
2. Adoption of the agenda and organization of work.
3. Review of the reports of the Secretary-General prepared for the eighth session of the Commission on Sustainable Development dealing with the issues of integrated planning and the management of land and water resources.
4. Outcome of the seventh and eighth sessions of the Commission on Sustainable Development.
5. Strengthening and coordination of the activities of the United Nations system in the field of water resources.
6. Key issues related to the integrated planning and management of land use, ecosystems and freshwater development, use and protection, with special emphasis on the impact of the quantity and quality of shared waters of riparian States.
7. Follow-up to the first session of the Committee.
8. Contribution to the ninth session of the Commission on Sustainable Development and its preparatory process.
9. World energy assessment report: its implication for sustainable energy policy development.
10. Review of salient trends and issues on energy development and use in the context of sustainable development:
    (a) Energy and the residential sector;
    (b) Renewable sources of energy, with special emphasis on solar energy;
    (c) New financial mechanisms and economic ins[illegible]

(d) Promising strategies and initiatives to accelerate the development and implementation of sustainable energy technologies;

(e) Coordination of energy activities within the United Nations system.

11. The multi-purpose use of hydro resources.

12. Provisional agenda for the third session of the Committee.

13. Adoption of the report of the Committee on its second session.

E. Documentation

12. The list of documents before the Committee at its second session is contained in the annex.

Annex

Documents before the Committee at its second session

Document symbol	*Agenda item*	*Title or description*
E/C.14/2000/1	2	Provisional agenda
E/C.14/2000/2	3	Report of the Secretary-General on issues related to the spatial planning of land (including minerals) and water resources
E/C.14/2000/3	6	Inter-sessional issue paper on integrated water resources management: reconciling the interests of water use, land use and ecosystems
E/C.14/2000/4	10 (c)	Report of the Secretary-General on financial mechanisms and economic instruments to speed up the investment in sustainable energy development
E/C.14/2000/5	11	Report of the Secretary-General on the status of hydroelectricity generation
E/C.14/2000/6	10 (e)	Report of the Secretary-General on the coordination of energy activities within the United Nations system
E/C.14/2000/7	7	Report of the Secretary-General on the follow-up to the first session of the Committee on Energy and Natural Resources for Development: energy sector
E/C.14/2000/8	10 (a)	Report of the Secretary-General on energy and the residential sector
E/C.14/2000/9	10 (b)	Report of the Secretary-General on renewable sources of energy, with emphasis on solar energy
E/C.14/2000/10	5	Report of the Secretary-General on technical cooperation activities of the United Nations system in the field of water resources
E/CN.17/2000/12	8	Report of the Ad Hoc Open-Ended Intergovernmental Group of Experts on Energy and Sustainable Development (New York, 6-10 March 2000)
E/CN.17/2000/13	3	Report of the Secretary-General on the progress made in providing safe water supply and sanitation for all during the 1990s
E/C.14/2000/L.1	2	Organization of work of the session: note by the Secretariat
E/C.14/2000/L.2	13	Draft report of the Committee

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